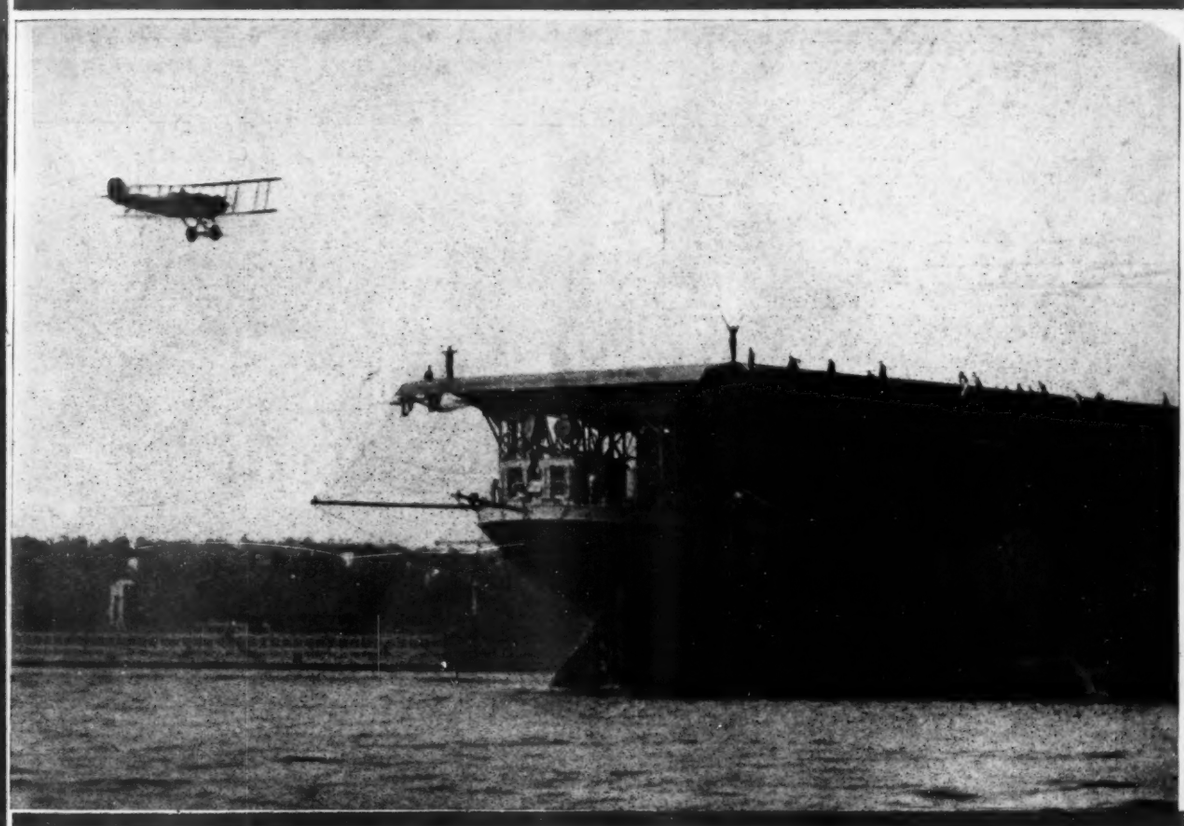
# AVIATION

AUGUST 13, 1923 Issued Weekly PRICE 10 CENTS



Vought naval observation plane about to land on the deck of the U. S. aircraft carrier Langley

VOLUME XV

NUMBER 7

## SPECIAL FEATURES

COMPARING MODERN WING PROFILES

PROGRESS IN BRITISH CIVIL AVIATION

CURTISS RACING SEAPLANE MAKES WORLD'S RECORD

ADVANTAGES AND DRAWBACKS OF FLEXIBLE ENGINE MOUNTING

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AUGUST 13, 1923

# AVIATION

VOL. XV. NO. 7

*Member of the Audit Bureau of Circulations*

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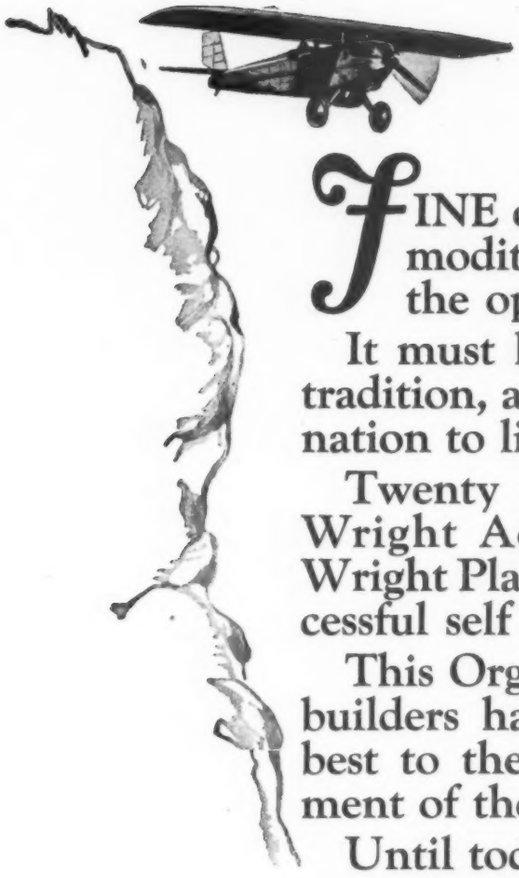

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# AVIATION

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Vol. XV August 13, 1923 No. 7

## A Real Loss

IN the death of President Harding, the American aviation world lost a true friend. The interest shown by the late President in our air development was not only genuine but personal. He showed in many ways that he realized in full measure the necessity of expanding our air activities, both governmental and civil.

While plans had been considered and definite outlines made for a merging of all National Defense functions in one department, with a Secretary for Defense who would be responsible through assistants for the military, naval and aerial services, the time had not come for outspoken action. It is to be hoped that this cherished hope of President Harding will not be forgotten.

Friends of aeronautics found in the President the same cordiality, sympathy and encouragement that made him so generally beloved. No effort to advance aviation seemed to be too great for him to make and such progress as has been made is due largely to his encouragement and support.

The bereavement that has come to the country as a whole affects the aeronautical world with particular poignancy. Here, there were no differences of opinion, no debatable problems and no causes for friction. Every airman will mourn the loss of a real friend of aerial progress.

## Our River Airways

IN considering the general outlay of the proposed national airway system it is surprising to note that the immense natural resources offered by America's extensive waterways is totally overlooked. Indeed, this is a point which seldom receives proper recognition, when as a matter of fact it deserves the most careful study.

A glance at a map will show that the Mississippi with its numerous tributaries offers an ideal net of river airways for linking up the more important centers of population of the central portion of the United States.

All this immense territory has the most stupendous natural facilities for thousands of miles of airways of the safest kind—over water, where an aircraft is constantly over a smooth landing field, and where engine trouble can therefore be dismissed as a mere annoyance. Thus, the so-called ground organization of airports, emergency fields and markers, which often require a huge outlay and great difficulties over land, is almost automatically solved by nature on the river airways. The river is airport, emergency field and marker at the same time. To open it to aerial traffic only requires a few slipways, hangars and mooring buoys—an expense which is disproportionately small when compared to that involved in organizing land airways. Furthermore, rivers generally run through the heart of cities and towns, allowing for central location of airports, as against excentric location on land, which makes for a very material saving of time in air traffic.

Another factor which handicaps public air services is the twelve hour operation of airplanes as against the twenty-four hour operation of railroads. This handicap will exist as long as the question of night flying is not solved. So far, it is still in the experimental stage. Over land, the expense of a night flying organization is very great owing to the large number of beacons and emergency fields required. Over a river, the question of emergency fields is automatically eliminated, while the expense of marking the airway with beacons is greatly reduced, for the night-flying seaplane can keep the airway constantly illuminated by means of a searchlight carried on board.

## A Vision of the Future

THOSE who are skeptical regarding the ability of aircraft to occupy a given territory in addition to conquering it by means of bombs and machine gun fire, may perhaps find food for reflection in the illustration of the latest British troop-carrying plane which appears in this issue. Carrying twenty-five fully equipped infantrymen at a speed of about 100 miles per hour, this airplane is merely one of a type Great Britain has been developing during the past year for future emergencies.

It does not require much imagination to visualize a fleet of such airplanes in action. One hundred of them could carry a force of 2500 men to occupy certain territory of strategical value and hold it by being provisioned from the air. Single airplanes of this type could land working parties at important railroad junctions and sidings, tunnels, canals, water works, etc. situated in the heart of enemy territory and blow them up, probably with greater certainty than could be accomplished by aerial bombing.

Such a picture is, incidentally, less fanciful than it appears on first sight. A month or so before the Armistice, a French bombing plane carrying a crew of three set out from the French lines, landed its party in German occupied territory near a tunnel which was believed to be used for important enemy troop movements. As a matter of fact, the wrecking party found that the tunnel was little used, but that instead a nearby canal was carrying a large amount of military traffic, whereupon they neatly blew up a lock, reembarked in their plane and returned to their base. The intelligence service later reported that traffic on this canal had been interrupted for three weeks as the result of this "Special mission", done by a regular three-seater bombing plane.

It may be concluded from this actual occurrence that when specially designed "'demolition planes" will be used for such purposes the results will be infinitely greater in scope and result.

# A Comparison of Some Modern Wing Profiles

## Eleven Optimum Profiles Selected from N.A.C.A. Reports Satisfy Requirements of Most Airplanes

By MATTHEW B. SELLERS

The object of the present article is to call attention to a desirable means of comparing the aerodynamic suitability of wing profiles in airplane design, with special reference to the best among the 375 wing profiles shown in Reports 94 and 124 of the National Advisory Committee for Aeronautics.

The properties of a profile are shown in Fig. 1 in a single plotted curve having the lift for abscissas and the *L/D* for ordinates. Thus, the higher the curve extends, the greater the *L/D*, and the farther to the right, the greater the lift. This type of graph was used by the writer in the February, 1914, and September, 1916, issues of *Aeronautics*, of New York, to compare the wing profiles tested by M. Eiffel.

While it is not possible to select a single profile that would be "the best," it appears that a small number of "best" profiles could be chosen or developed, which would satisfy the requirements of nearly all airplanes designed. It is with this assumption in mind, that the profiles given in the various reports of aerodynamic laboratories were studied, and those chosen which seem to be the best in their class.

The reports in question cover the following number of profiles: M.I.T. 71, Washington Navy Yard 8, N.P.L. 110, Eiffel 71, Crocco 4 and Goettingen 111. A strict comparison between these profiles is not possible, because of different types of tunnel, air speed, size and aspect ratio. The *L/D* ratio at small angles improves with increasing size of model and wind speed, and no allowance has been made for this factor in the accompanying graph and tables.

Most of these profiles may be divided into three classes. Class I includes profiles with flat under surface or "face"; Class II those with a concavity in the front two-thirds of face, such as No. 340; and Class III those with a concavity in the rear two-thirds of the face, such as No. 235 (See Fig. 1).

Of these, Class I appear to be the best all-round profiles, considering facility of construction together with aerodynamic qualities. Slight changes in the form of the nose and the curve of the back affect their performance, however, and it is probable that still better profiles of this class can be produced as the result of comparative experimentation. These are illustrated in Fig. 1 by the drawings 346 and 33, and in the graphs by 343-345-346-33.

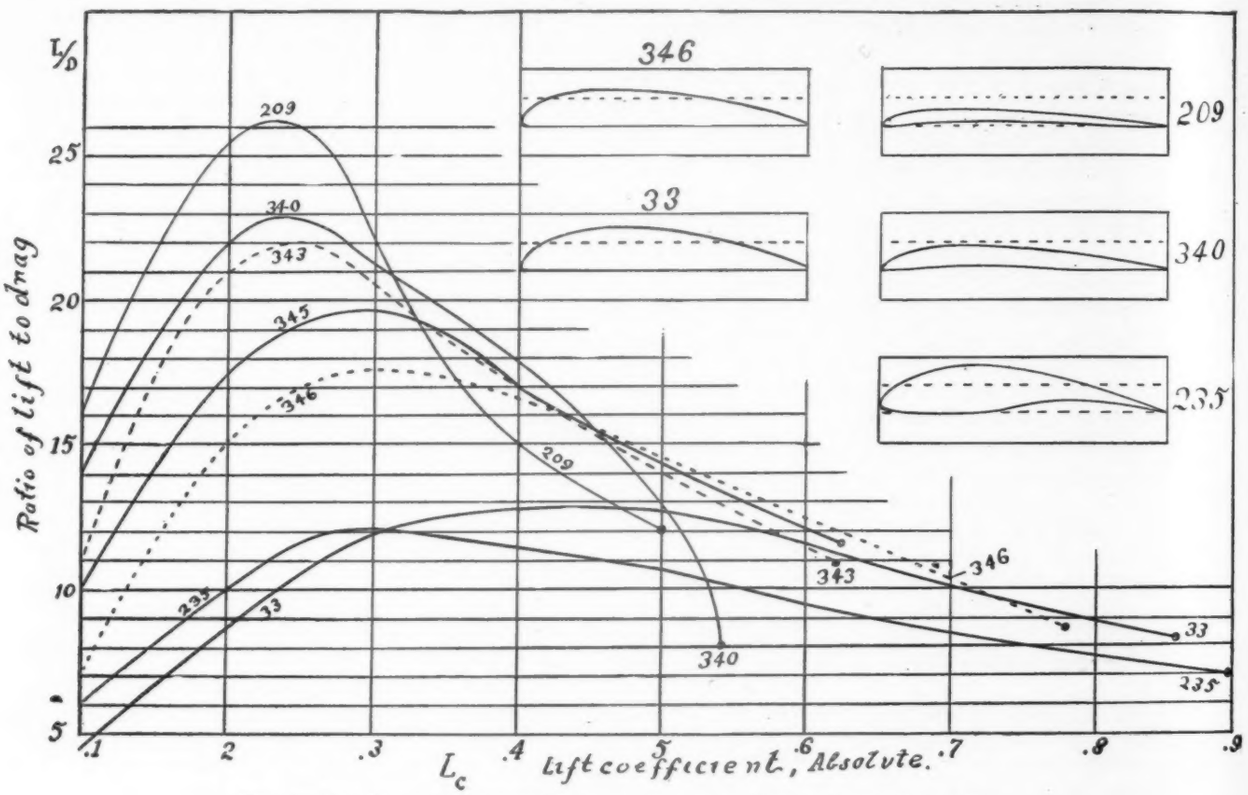



*Fig. 1. Aerodynamic characteristics of some outstanding modern wing profiles*

In airplane design, wing sections of different thickness are required. The best thin sections give higher lift ratios than the best thick ones, but the latter are generally better at large angles of incidence. With reference to Tables I and II it should be noted that profiles 343, 345, 346 and 33 are progressively thicker.

In Table I the lift coefficients ($L_c$) are in the first vertical column, the number of each profile being in the uppermost horizontal column, and the *L/D* ratios in line with each lift constant. The lift constants are in absolute units (to convert into pounds per mile per hour multiply by 0.005). At the bottom of Table I the symbol $L_m$ indicates maximum lift; $V_1$ speed of air current times chord of model, in feet; *AR* the aspect ratio of model; and *H* the maximum ordinate of the profile. Profiles 57 and 340 are from the Washington Navy Yard wind tunnel; 343, 344, 345 and 346 from N.P.L.; 33 from Massachusetts Institute of Technology; 235 and 310 from Goettingen; and 209 and 203 from Eiffel's Laboratory.

In Table II the dimensions of the different profiles are given in percentage of chord.

Turning now to the profiles having their concavity in the front two-thirds of the face, that is Nos. 57, 209 and 340, these are very good. Profile No. 209 shows the highest $L/D$ ratio—26—which may in part be due to its high aspect ratio. No. 57 is, however, better at small angles than No. 209. Both are high speed wings, but both are unfortunately too thin for average construction. No. 340 is slightly better than No. 343, with a lift curve better at the burble point. This is a good all-round wing.

The thick Goettingen profiles No. 235 and 310 have the concavity in the rear two-thirds of the face. No. 235 is well suited for a single box spar, and has high maximum lift and a better speed range than No. 33, which is a flat face profile. No. 310 has a high $L/D$ at low lift, and is good for speed range.

The best speed range is afforded by Eiffel No. 203, which has a $L/D$ of 19 at the low lift of 0.1. With this profile a speed range of three to one can be obtained, with $L/D$ of 17 at maximum speed, and $L/D$ of 12 at minimum speed. The wind tunnel model of this profile had an aspect ratio of 8.

The center of pressure movement is not considered in this comparative study inasmuch as it is available only for a few of these profiles. However, where it is given, it would seem to be satisfactory.

While only seven profiles are shown in Fig. 1, those given were selected as being perhaps the most representative of the different classes, and not because they are absolutely better than the others described. The inclusion of a greater number of profiles would have made the graph appear too crowded for practical purposes.

The writer has given considerable study to this subject, and has endeavored to include in this article enough of the best profiles to serve the needs of the aeronautical engineer. Careful analysis of the profiles given will show there is still plenty of room for further improvement in wing profile design.

TABLE I. AERODYNAMIC CHARACTERISTICS OF WING PROFILES

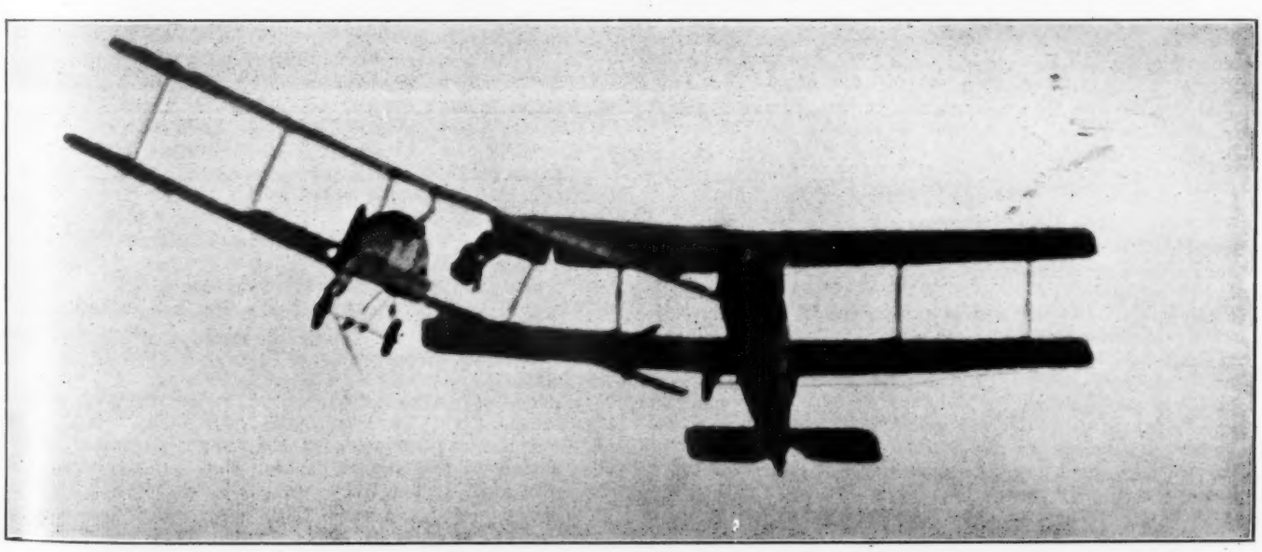
| $L_c$ | 57 | 340 | 343 | 344 | 345 | 346 | 33 | 235 | 310 | 209 | 203 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| .1 | 20 | 14 | 11 | 10.2 | 10 | 6 | 4.2 | 6 | 14 | 16 | 19 |
| .2 | 24.7 | 22 | 21 | 18.5 | 17.5 | 14 | 9 | 10 | 19 | 25 | 19 |
| .3 | 18 | 21.5 | 21 | 20 | 19.7 | 17.5 | 12 | 12 | 17.5 | 22 | 17 |
| .4 | 12 | 18.1 | 16.8 | 17 | 17 | 16.5 | 13 | 11.5 | 15 | 15 | 15 |
| .5 | 7 | 13 | 14 | 14.1 | 14.2 | 14.5 | 12.4 | 10.6 | 12.6 | 12 | 12.8 |
| .6 | | | 11.2 | 11 | 12.2 | 12.2 | 11.3 | 9.5 | 10.5 | | |
| .7 | | | | | | 10.2 | 10 | 8.6 | | | |
| .8 | | | | | | | 9 | 7.6 | | | |
| $L_{ca}$ | 5.3 | 5.5 | 6.2 | 6 | 6.1 | 7.8 | 8.6 | 9 | 6.8 | 4.5 | 5.3 |
| $V_1$ | 23 | 25 | 38 | 3.8 | 3.8 | 3.8 | 11 | 15 | 6.5 | 27 | 29 |
| $AR$ | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 8 | 8.4 |
| $H$ | 5.6 | 8.8 | 8.2 | 8.2 | 10.1 | 12.7 | 15.8 | 16.4 | 13.8 | 5.8 | 8.5 |

TABLE II. DIMENSIONS OF WING PROFILES

Ordinates in Percent of Chord

| % | 57 | | 209 | | 340 | | 343 | | 344 | | 345 | | 346 | | 33 | | 235 | | 310 | | 203 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 07 | 0.7 | 0.7 | 0.7 | 1.08 | 1.08 | rad. | 133 | rad. | .83 | Rad. | .83 | Rad. | 2.00 | 1.5 | 1.5 | 2.75 | 2.75 | 4.49 | 4.49 | 2.7 | 2.7 |
| 1¼ | 1.8 | 0.3 | 1.9 | 0.0 | 2.3 | .30 | 3.15 | .02 | 2.45 | .00 | 2.70 | .00 | 4.80 | .15 | 4.0 | 0.1 | 5.50 | 1.70 | 6.49 | 2.43 | 3.7 | 1.4 |
| 2½ | 2.6 | 0.1 | 25 | 0.1 | 3.2 | .16 | 3.98 | .00 | 3.37 | .00 | 3.70 | .00 | 6.55 | .00 | 5.6 | 0.0 | 7.00 | 1.40 | 7.57 | 1.62 | 4.5 | 0.7 |
| 5 | 3.4 | 0.0 | 3.6 | 0.3 | 4.64 | .04 | 5.10 | .00 | 4.65 | .00 | 5.28 | .00 | 7.94 | .00 | 8.3 | 0.0 | 9.00 | .95 | 9.19 | .86 | 5.7 | 0.0 |
| 7½ | 4 | 0.1 | 4.4 | 0.6 | 5.66 | .02 | 5.90 | .00 | 5.60 | .00 | 6.60 | .00 | 9.25 | .00 | 10 | 0.0 | 10.57 | .60 | 10.22 | .38 | 6.6 | 0.0 |
| 10 | 4.4 | 0.1 | 5.0 | 0.9 | 6.54 | .00 | 6.51 | .00 | 6.25 | .00 | 7.58 | .00 | 10.20 | .00 | 11.4 | 0.0 | 12.00 | .35 | 11 08 | .11 | 7.3 | 0.0 |
| 15 | 4.9 | 0.4 | 5.6 | 1.4 | 7.62 | .14 | 7.25 | .00 | 7.20 | .00 | 9.00 | .00 | 11.45 | .00 | 13.3 | 0.0 | 14.05 | .00 | 12.27 | .0 | 8.0 | 0.1 |
| 20 | 5.3 | 0.5 | 5.8 | 1.6 | 8.36 | .52 | 7.75 | .00 | 7.85 | .00 | 9.76 | .00 | 12.18 | .00 | 14.5 | 0.0 | 15.25 | .00 | 12.97 | .0 | 8.3 | 0.4 |
| 30 | 5.6 | 0.6 | 5.8 | 1.7 | 8.78 | 1.28 | 8.17 | .00 | 8.16 | .00 | 10.14 | .00 | 12.70 | .00 | 15.8 | 0.0 | 16.40 | .23 | 13.84 | .49 | 8.5 | 0.7 |
| 40 | 5.6 | 0.6 | 5.7 | 1.6 | 8.50 | 1.36 | 8.06 | .00 | 7.90 | .00 | 9.85 | .00 | 12.44 | .00 | 15.7 | 0.0 | 16.40 | 1.30 | 13.51 | 1.08 | 8.1 | 0.8 |
| 50 | 5.3 | 0.5 | 5.2 | 1.4 | 7.80 | .80 | 7.61 | .00 | 7.20 | .00 | 9.25 | .00 | 11.51 | .00 | 14.7 | 0.0 | 15.08 | 2.95 | 12.54 | 1.78 | 7.4 | 0.7 |
| 60 | 4.8 | 0.4 | 4.3 | 0.8 | 6.86 | .20 | 6.94 | .00 | 6.30 | .00 | 8.35 | .00 | 10.20 | .00 | 13.1 | 0.0 | 13.00 | 4.37 | 10.97 | 2.32 | 6.4 | 0.5 |
| 70 | 4.1 | 0.3 | 3.3 | 0.4 | 5.54 | .06 | 5.93 | .00 | 5.30 | .00 | 7.05 | .00 | 8.60 | .00 | 10.9 | 0.0 | 10.50 | 5.00 | 8.97 | 2.65 | 5.3 | 0.2 |
| 80 | 3.3 | 0.2 | 2.4 | 0.0 | 4.06 | .06 | 4.51 | .00 | 4.10 | .00 | 5.33 | .00 | 6.68 | .00 | 8.0 | 0.0 | 7.40 | 4.50 | 6.43 | 2.32 | 4.2 | 0.1 |
| 90 | 2.1 | 0.1 | 1.4 | 0.0 | 2.36 | .18 | 2.73 | .00 | 2.65 | .00 | 3.25 | .00 | 4.23 | .00 | 5.0 | 0.0 | 4.00 | 2.75 | 3.41 | 1.46 | 2.6 | 0.0 |
| 95 | 1.4 | 0.0 | 1.0 | 0.0 | 1.48 | .25 | 1.85 | .00 | 1.85 | .00 | 2.25 | .00 | 3.00 | .00 | 3.4 | 0.0 | 2.23 | 1.50 | 1.89 | .81 | 1.6 | 0.2 |
| 100 | 0.6 | 0.0 | 0.6 | 0.0 | .58 | .38 | .40 | .40 | .50 | .50 | .65 | .65 | .75 | .75 | 1.0 | 1.0 | .40 | .00 | .22 | .00 | 0.5 | 0.5 |

# Collision of Airplanes Recorded by Camera



(c) International Newsreel

*This extraordinary photograph shows two British airplanes at the moment of colliding over Hendon, near London. The two ships fell with wings interlocked, but the pilots escaped death*

# Progress of British Civil Aviation, 1922-23

## Summary of Annual Report of Civil Air Department Records
## Satisfactory Growth of Civil Flying

The progress of British civil aviation during the twelve months ending March 31, 1922, is reviewed in a report just issued by the British Air Ministry, which is summarized below. This report which is now published annually, instead of half-yearly, as in the past, is of particular interest in that it sets forth the types of commercial aircraft which the British Air Ministry seeks to develop "to meet the probable requirements of civil air transport in the near future."

### *Three Types of Commercial Planes*

Specifications have been drafted for three distinct types of airplanes, each type answering the particular requirements of the airway on which they are to be used. These types are the following: (1) a single-engined plane for service in Europe; (2) a single or three-engined plane for service in the Middle-East; and (3) a three-engined plane of high power for imperial communications.

The first or "European" type of machine may be driven by any approved type of British power plant. Only one engine is provided for in view of the fairly advanced state of ground organizations in Europe. The machine must have a crew of two, but the actual number of passengers will naturally depend upon the engine chosen by the designer and the general design of the machine. The only stipulation made is that one ton of passengers and baggage must be carried for every 400 hp. The cabin of the machine must be easily convertible into an ambulance, and must be able to float for a considerable time on calm water. It must carry fuel for a flight of 3½ hr. at 100 m.p.h. Its speed must range from 110 m.p.h. at a height of 3000 ft. to a landing speed of 45 m.p.h.

The airplane for the Middle East may have one or three engines (the system of two engines is barred), but the total horsepower is not to exceed 1000. The machine must be able to fly level on two-thirds of its full horsepower when carrying three-quarters of its disposable load. It must also be specially designed to withstand great variations of temperature and humidity, and metal construction is considered preferable, though not essential.

The machine will have a crew of two and must accommodate not less than eight passengers, allowing 236 lb. per passenger with his baggage. Elaborate arrangements for the comfort of the passengers are required. A fan must drive air through a screen down which water will constantly drip, an icechest must be carried, and there must be cooking arrangements as well as a supply of drinking water. Long flights are contemplated, and the machine must be able to fly for 500 miles at full throttle at a height of 10,000 ft. against a wind of 30 m.p.h. The top speed at that height must be 95 m.p.h., the landing speed 45 m.p.h., and the machine must pull up in 200 yd.

### *Imperial Transport Plane*

The machine for Empire communications must have three engines, all of one type, and a total of 2100 hp. is allowed. The machine must be able to fly level carrying three-quarters of its disposable load on two of the engines. The top speed at a height of 10,000 ft., need not be above 90 m.p.h. and a landing speed of 50 is allowed, provided that the airplane pulls up in 200 yd. The provisions for cooling, etc., are similar to those of the Middle East machine. The Empire machine will carry a crew of four, and sleeping accommodations must be provided for two of them. Passengers will be allowed less baggage than in the Middle East by 26 lb. each. The specification says that as many passengers as possible (in proportion to the horsepower) are to be carried. Fuel must be taken for a flight of 1300 miles at a height of 10,000 ft. against a wind of 15 m.p.h.

In the case of all three types, metal propellers must be used, and the engines must be silenced. All tanks must be self-sealing unless they are placed under the top planes in such a position that any escaping fuel will be blown clear of the machine. These last provisions will greatly minimize the danger of fire.

The specifications for the three above types of airplanes were drafted as a result of a scientific and technical investigation instituted by the Civil Aviation Advisory Board on the practicability and cost of an imperial air mail service.

Of course, no airplane in the British commercial service answers as yet these requirements, although the DH34 used by the Daimler Airway and by the Instone Airline approximates the specification of the "European type", save for the landing speed, which is over 70 m.p.h. in the DH34 as against the 45 m.p.h. required.

Another large capacity British commercial airplane which has recently been completed is the Vickers "Vanguard" which is not yet in service. This twin-tractor biplane which was developed from the Vickers "Commercial" is equipped with two 450 hp. Napier "Lion" engines, and carries a crew of two and twenty-three passengers and baggage. It has a speed of 100 m.p.h. and an air endurance of 4½ hr. The passengers' cabin is 6 ft. 6 in. high internally. Collapsible tables are fitted for the use of passengers, and a gangway is provided the whole length of the cabin. Electric light and all necessary conveniences are provided, and the cabin will be ventilated by an approved system which will provide a plentiful supply of warm or cold air as required.

### *Commercial Air Services*

An investigation carried out by the Subsidies Committee, under the chairmanship of Sir. Herbert Hambling, resulted in the conclusion that the creation of a new commercial organization run entirely on business lines, with a privileged position with regard to subsidies, was the best solution for subsidizing air transport. The Committee recommended that a company with a capital of one million pounds (of which at first £500,000 should be subscribed) should be guaranteed by the government a subsidy of not less than one million pounds, which should spread over a period of ten years and be repayable to the government out of future profits.

The conditions of the subsidy paid to the existing air transport companies were revised as from Oct. 1, 1922, in order to eliminate competition among State supported Services to extend British transport activities as far into Europe as possible with the money available and to establish at least one internal air route in Great Britain.

Under the revised scheme the London-Paris route is operated by Handley Page Transport Limited, the London-Brussels-Cologne route by Instone Air Line Limited, and the Manchester-London-Amsterdam route by Daimler Hire Limited, while a new company, the British Marine Air Navigation Company Limited, has been approved for the operation of Southampton-Cherbourg-Havre and Channel Islands routes.

A greater use is being made of air taxi-machines, and during the year the De Haviland Aeroplane Hire Service flew over 100,000 miles, the hire rates being now reduced to 2 shillings a mile for a three passenger machine.

Skywriting for advertisement purposes has reached a practical stage and the Savage Sky Writing Co. now owns and operates a fleet of eighteen single-seater machines, giving employment to sixteen pilots.

Extended use of aerial survey for commercial purposes has been made during the year notably in connection with the Electric Railway extension to Edgware, the construction of the new London-Southend arterial road and the erection of hydro-electric plant at Loch Neagh (North Ireland).

Although the increase in traffic on the London-Paris air route in the Summer of 1922 failed to attain the dimensions expected, there was nevertheless a considerable increase in the total air traffic during the year under review as compared with the previous year.

Air transport flights (internal and continental) numbered 4,000, in the course of which 11,460 passengers and 216.4 tons of goods were carried, while in the previous year the corresponding figures were 1,156 flights, 5,692 passengers, and 26.6 tons of goods. A larger proportion of the total flying consisted of air transport, as distinct from joy riding, than in the previous year. British aircraft gained a larger share of the cross-channel air traffic than in the previous year. Out of a total of 5,137 flight and 13,172 passengers, 2,965 flights were made and 10,066 passengers were carried by British aircraft, representing percentages of 57.7 and 76.4 respectively, whereas for the year ending March, 1922, the corresponding percentages were 33.1 and 51.5.

### *Increase in Operating Efficiency*

The efficiency of the British services has steadily increased. In the case of the London-Paris service the efficiency rose from 85 per cent in the year ending September, 1920, to 89 per cent in the following year and to 92 per cent in the year ending September, 1922. During the six months following the reorganization of the services in October last year, the average efficiency was maintained at 83 per cent, although two of these services were operating over new routes and winter conditions had set in.

For the second consecutive year no passenger was killed in the course of flights on regular air services. One passenger, was, however, slightly injured in a collision on the ground.

Valuable data was obtained from the series of experimental flights by night which was carried out in February on the London-Paris route. In spite of the unfavorable conditions it was possible to confirm that night flying on the route in the absence of fog and low cloud is as commercially practicable as daylight flying. Further experiments will be carried out to ascertain how the special difficulties of night flying in adverse weather conditions may be overcome.

### *Training of Reserve Officers*

Reference is made to the scheme for the flying training of the Royal Air Force Reserve of Officers at civil training schools. In general terms the objects of this scheme are, as well as providing an efficient flying training, to stimulate aviation, to provide employment for firms connected with civil aviation, and to secure training centers that will be so situated as to suit the convenience of the Reserve officers.

With a view to distributing the schools over the United Kingdom as far as possible the following centers have been selected and approximately seventy pupils will be trained at each school:—

London—De Haviland Aircraft Co., Ltd.
Bristol—Bristol Aeroplane Co., Ltd.
Coventry—Armstrong Siddeley Motors, Ltd.
Renfrew—William Beardmore & Co., Ltd.

The training comprises a course not exceeding twenty-four days per annum, which is normally taken quarterly, but can be taken in one complete period at the discretion of the Air Ministry. For those who, on first joining the Reserve, are considerably out of practice in flying a special requalifying course is given, up to a maximum of two months.

The estimates for civil aviation in 1923-24 cover a net sum of £287,000 with an additional £20,891 as the cost of the headquarters staff. The estimates for meteorological services are not included in the estimates for civil aviation as was the case in previous years.

### *Navigation*

In order to minimize the risk of collisions occuring between aircraft flying on regular air routes, the Belgian, French, and British governments have supplemented the rules of the air contained in the International Air Convention by new rules designed to keep aircraft at a safe distance from one another when following an officially defined route.

An improved system of traffic control has been introduced at the Croydon airdrome by which a traffic officer who is in wireless touch with the aircraft is able to keep a check on the position of machines at every stage of their journey. The constant practice obtained by this officer in plotting positions is of great value during conditions of low clouds, mist or darkness, in enabling pilots to obtain information regarding their position when they are prevented from observing the ground. Other information is also passed to aircraft in flight, as, for example, warnings regarding weather conditions, or the close proximity of other machines when the visibility is bad.

Experiments are under way at Croydon airdrome with a sound-locating device, by means of which a skilled operator at the airdrome is able to locate the direction of an approaching machine during weather conditions which render it impossible to see the machine and when the aircraft is at such close range that direction finding by wireless telephony is impracticable.

To facilitate accurate navigation by night a second route-marking light of 250,000 candle power (nominal) has been installed on the continental air route, at Cranbrook, Kent, and an illuminated wind indicator has been erected at the landing ground at Penshurst. Further an experimental strontium-colored acetylene beacon exhibiting an intense red flame has been installed at Croydon airdrome with the object of testing the power of this flame to penetrate mist during day and night.

### *Progress in Radio*

The wireless stations at Manchester and Birmingham airdromes have been reopened, and a new station has been erected at Bickendorf airdrome, Cologne. The establishment in the near future of a service between Southampton and Havre or Cherbourg has rendered necessary the erection of a station at Guernsey.

Considerable progress has been made in improving designs of civil aircraft by increasing the lifting capacity of aerofoils and thereby increasing the useful load carried and reducing the landing speed.

The factor of safety of civil flying has been raised as the result of investigations into various methods of fire prevention, and through the elimination of a majority of the causes of engine failure, and a considerable amount of work has been done in defining the minimum flying requirements of civil aircraft, more especially in regard to taking off, landing, balance, stability and controllability.

Aircraft engines and their accessories have been improved by investigating such matters as the limiting loadings for ball, roller and plain bearings and the stresses in crankshafts and other vital parts. Engines using heavy oils by direct fuel injection are being developed and are giving promising results. The reliability of the turbo super-charging system has been improved.

### *Aeronautical Maps*

British sheets of the general aeronautical series have been completed to proof stage for Britain, Balkans, Egypt, Iraq and Oman, and their publication is being proceeded with. Those for Kordofan, Baluchistan, and Japan-Vancouver route are in hand. Yemen and Algeria are included in the program. The French sheet for Spain is completed for proof stage and a sheet for Belgium is in hand.

Two sheets of the local aeronautical series covering Southern and S. E. England, South of the line Watford—Cardiff, and East of the line Cardiff—Taunton, will be published shortly. Two experimental route maps are in hand, one covering the London-Manchester route, and the other the London-Paris route.

Statistics have been collected which go to prove that if pilots maintain reasonable habits and regular exercise, and also are reasonable in their indulgence in alcohol and tobacco, a long and useful flying life can be confidently looked forward to for the great majority of those who take up this work as a profession.

It is a matter of interest to would be passengers to record that the great majority of present civilian pilots have a physical standard higher than the normal.

### *Dominions and Colonies*

The Australian Commonwealth Government has decided upon the immediate establishment of six trunk air lines, two of which, Geraldton-Derby (1195 miles) and Charleville-Cloncurry (560 miles), are already being operated with success.

The Canadian Government Air Services have been reorganized in connection with the creation of a Ministry of

Defence, but the general policy of Air Board which aimed at employing the air units to the maximum benefit of the Dominion is being continued. A wide range of duties, chief among which are forest fire patrols and aerial photography, are carried out on behalf of other government departments and provincial governments. The work carried out by commercial aircraft has increased considerably.

The Indian Air Board is considering the organization of the Calcutta-Rangoon route. The problem of forest survey by aerial photography has also been under consideration.

In the Middle East, traffic on the Cairo-Baghdad air mail service has increased three-fold during the course of 1922.

In Newfoundland the Aerial Survey Co. has accomplished much valuable pioneering work in connection with seal spotting, aerial survey, and the carriage of mails. The company has established eight bases, four in Newfoundland and four in Labrador.

The New Zealand government at present subsidizes three companies and in addition work is found for the companies in giving refresher courses to service pilots.

An Air Navigation Bill has been submitted to the South African Parliament.

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# Has Your Town a Landing Field?

## Aeronautical Safety Code Lists Necessary Requirements

Experts of the Bureau of Standards of the Department of Commerce believe that within the next ten years the United States will see an extension of the use of aircraft for business and pleasure somewhat similar to the extension in the use of automobiles between 1905 and 1915. Airplanes will be used more and more for carrying mails and perishable goods, while it is not impossible that people of moderate wealth will find them useful for commuting, for business trips, and for week-end and vacation trips.

The effect of the airplane, if developed as is expected, will be to extend very greatly the distance to which such trips can be made in a given period of time. They will permit commuting from distances of a hundred miles, while week-end trips can be made from New York to the Thousand Islands, from San Francisco to Yosemite, from Washington and Baltimore to the mountains of Virginia, and from Boston to the Maine woods.

If the visions of the experts materialize, people whose business requires only occasional visits to the city can live almost anywhere they choose, while some of our wealthiest men can spend their winters in Florida and their summers in Nova Scotia, and still keep in touch with business interests in New York.

### *Town with Good Landing Field Will Get the Business*

All of these possibilities indicate a considerable extension of the city's influence, with rise in real estate values and an increase in prosperity for many of our smaller towns. But it must be remembered that the airplane traffic will not be evenly distributed. The flying people go where landing facilities are provided. The town that first provides these facilities should become popular with aircraft and may in later years be the fashionable resort of the region. Good rail and motor roads, combined with beautiful scenery, have made our fashionable suburbs and summer resorts of to-day, and even so good landing fields combined with other desirable characteristics should help make the fashionable suburbs and summer resorts of the future.

The requisite dimensions, proportions, and equipment of landing fields have been thoroughly studied by experts and the best modern knowledge on the subject is embodied in the National Aeronautical Safety Code now being prepared under the auspices of the Bureau of Standards and the Society of Automotive Engineers.

This code specifies first of all the methods of rating and grading landing fields, the rating being in accordance with the facilities provided and being designated by a number, while the grading is done in accordance with the size and character of the landing area and is designated by a letter. Thus an A1 landing field is one of the largest necessary size and equipped with all needed facilities, an A4 is a large field poorly equipped, etc.

Fields rated as first class (1) will have hangar space, repair equipment, tools, etc.; supplies of fuel, oil, water, and spare parts, telephone communication; hotel near, and convenient transportation to the metropolis for passenger and freight; attendants at all times; guard to enforce field regulations; obstacle lights, course lights, and night ground wind indicator; visible beacon; radio, both beacon and communication.

Second class fields will have all of this equipment except the beacon and radio equipment. Third class landing fields will have mooring space with some tools and repair equipment nearby; supplies of fuel, oil, and water accessible; telephone nearby; good roads to the city; attendant available upon arrangement. Fourth class fields are those intended for emergency landings only. Any field that cannot qualify in one of the higher classes will be rated as fourth class.

All of these fields are required to have certain markings. There must be a white circle one hundred feet in outside diameter and four feet wide at the center of the landing area, and a white marker three feet wide and thirty feet long to indicate the normal landing direction, or direction of landing with no wind. This marker is placed over the circle and its axis passes through the center of the circle. There should also be a marker indicating the name of the field and its location. These are described in the code.

There must be in addition a wind cone to tell the direction and approximate velocity of the wind, and the boundaries of the field must be plainly visible. All of the markings should be concealed when the field is not in use.

### *Graded According to Size*

The code also specifies the dimensions that landing fields of different grades must have, and the extent to which approach to them may be obstructed. Any high obstruction at the edge of the field is assumed to reduce the effective length of the field in that direction by an amount equal to seven times the height of the obstruction. Thus a grove of trees 50 ft. high would reduce the length of the field by 350 ft.

A grade "A" landing field shall have a firm runway of not less than 2500 ft. in any direction, and all approaches shall be clear of obstructions. Its landing area should be nearly plane and shall be firm in wet weather.

A grade "B" landing may have a firm runway of 1800 ft. in any direction or two runways at right angles and each 2100 ft. long. These may be arranged in L, T, or X shape. In the latter case, all approaches must be clear, but if the field is good for taxiing in any direction, a total of 30 deg. out of 360 measured from the center of the field may be obstructed.

For grade "C" the corresponding dimensions are 1200 ft. if open in all directions and 1400 ft. if limited to two directions. A total obstruction of 90 deg. is permitted, but the ends of the runway must be unobstructed. The surface must be such as to permit emergency landings in wet weather.

Grade "D" fields are intended for emergency landings only. They should have at least one unobstructed runway 750 ft. long and 300 ft. wide.

All of these dimensions apply to fields at altitudes of less than three thousand feet. For fields at higher altitudes, the dimensions will have to be increased, the extent of the increase to be prescribed by the agency which has to do with registering landing fields.

The Airways Section, Office of the Chief of Air Service,

War Department, Washington, D. C., is the registering agency for landing fields in this country. Descriptions of all landing fields should be sent to this office, and they should be notified of any changes, *or of the abandonment of existing fields*. They are also prepared to furnish advice regarding the design and organization of landing fields.

The information furnished by this office is published by them and is available to aviators all over the country. Each field is separately described on a sheet that fits a small loose-leaf notebook. The description includes a statement of the grade and class of the field, its location and altitude, a map of the surrounding country showing the location of the field, statement of ownership, description of obstacles, and any other information likely to be useful. An aviator planning a trip can take with him sheets for all the fields he is likely to encounter on his trip and on which he is likely to want to make a landing.

For a grade "A" field, choose a fairly level tract of land whose least dimension is 2500 ft. after allowing seven times their height for all nearby obstruction. This land should be leveled off to avoid steep slopes, and all marshy spots filled in. A strong turf will make the best covering if the field is not extensively used. Otherwise it would be better to cover the most used parts with gravel or cinders. Bushes should be planted at points where landing airplanes are likely to run off the field.

The white circle, normal direction indicator, and other permanent markings can be made by digging trenches 6 in. to 12 in. deep and filling with white chalk, gravel, stone, or concrete to the level of the ground. Stone or concrete may be whitewashed.

The wind cone used for indicating the direction and strength of the wind is made of cloth, and is at least 10 ft. long and 24 in. in largest diameter. The windward end is stretched on a wire frame and is hung from the top of a mast in such a way that it turns freely. Such a cone will tell the direction of the wind, while the extent of its inflation tells the pilot whether he need to allow for the wind in making a landing. If the cone is inflexible, like a wind vane, it should have a streamer attached to indicate the existence of winds.

Other details may be obtained from the Airways Section, and these will also be embodied in the Code when it is completed. At present several sections of the code have been completed but none of it will be available till the rest is finished, which will probably be sometime next winter.

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# New British Aircraft at R. A. F. Pageant

## Twelve New Types of War Aircraft for Royal Air Force

At the Royal Air Force Pageant held at Hendon airdrome, near London, a large number of new British aircraft were shown on the ground and in flight.

Among the outstanding machines were many specially designed for ecoperation with the navy. Two are new ships' fighting planes designed to ascend from and alight on the decks of the aircraft carriers as well as on land airdromes. These are the Fairey "Flycatcher" and the Parnell "Plover," which are both fitted with 320 hp. "Jaguar" radial air-cooled engines.

Other types included the fleet-spotters and torpedo carriers. The former were represented by the Avro "Bison" and the Blackburn fleet-spotter, while torpedo carriers present were the Blackburn "Dart," with which the British naval torpedo air squadrons were recently equipped, and the Handley Page "Handley" which is peculiar in having the new "slotted" wing. An interesting machine built for naval reconnaissance duties is the "Seagull."

Among military land planes were several large troop-carriers, capable of carrying twenty-five fully equipped soldiers, in addition to their crew of two, new single and two-seater fighting machines, long distance reconnaissance aircraft, bombing machines, and all-metal airplane for various duties. The troop-carriers are the twin-engined Vickers "Victoria," a development of the Vickers "Vernon," now in use in Irak, and the Armstrong-Siddeley "Awana," a twin-engined all-metal machine, which is illustrated on this page. Single-seater fighters included the Siddley "Siskin," with a speed of 150 m.p.h. when flying at a height of three or four miles, and the Gloucester "Grebe." A new long-distance reconnaissance machine is the all-metal twin-engined "Bourges" airplane, which can be "stunted" like a pursuit ship.

Large bombing aircraft were represented by the Avro "Aldershot," with its 1000 hp. Napier "Cub" engine, while at the other end of the scale was the light plane, the "Wren," with a 7 hp. motorcycle engine. Another interesting new aircraft is the Fairey "Fawn," which has been constructed for long reconnaissance duties also, but differs from the "Bourges" in being a single-engined ship.

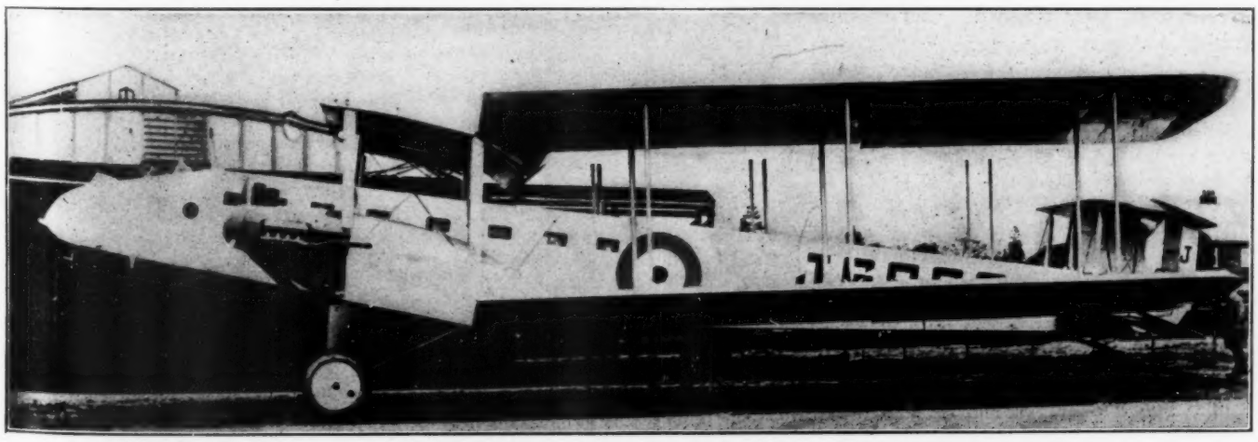


Photo International Reel

*Great Britain's latest troop-carrying plane, the Armstrong-Whitworth "Awana" (two 450 hp. Napier "Lion" engines), which is designed to carry 25 men with full equipment*

# Flexible Mounting of Airplane Engines*

## Rigid Mounting to be Preferred to Flexible Suspension

By K. KUTZBACH

This paper deals with the suggested installation, of the "unbalanced" 8-cylinder Vee engine (e. g. Benz III b, Koerting III, D III b), in that a flexible mounting be used instead of bolting the engine rigidly to the airplane structure; the idea being that the flexible mounting would be so adapted that the vibrations due to inertia effects would, as it were, "damp themselves out." In order to be able to judge of the practical feasibility of this proposal, it is first necessary to possess a clear idea of the forces which are set up and the movements which take place in an airplane engine.

### *Vibrations due to Inertia Effects*

Vibrations due purely to inertia effects, only manifest themselves when the engine is driven by an electric motor (which for convenience, is coupled to the engine instead of the propeller) the engine being suspended on long elastic cords and operating without compression. In this case, with a four-cylinder engine we would have free oscillation of the entire engine, the period of vibration being at the rate of twice the speed of revolution of the engine, the oscillations being parallel to the plane passing through the axis of the cylinders. In the case of an 8-cylinder engine (Vee type), consisting of two four-cylinder engines with the cylinders set at an angle of 90 deg., these oscillations combine to produce horizontal transverse oscillations, since the vertical components of the vibrations, due to the two separate sets of cylinders, neutralize one another.

If the amplitude of the movement of the crankcase is ascertained it will be found that, for example, in the Hispano-Suiza engine, at a speed of 2000 r.p.m., there are 4000 transverse vibrations per minute with a displacement of only 0.25 mm. (0.01 in.) whi'e, in the Benz III b engine, there is a displacement of about 0.3 mm. (0.012 in.). These small oscillations can be absorbed without difficulty by the employment of weak springs or similar contrivances, so that hardly any effect of the transverse vibrations, due to the inertia of the reciprocating parts, is imparted to the airplane; while at the same time the propeller thrust and torque are entirely taken up. It is, therefore, only necessary to preclude any possibility of resonance due to these transverse vibrations within the range of the engine speed met with in operation, say 300 to 2000 r.p.m.

For this purpose it is sufficient, if the transverse vibrations are kept below 300 per minute, which can be easily accomplished by suspending the engine freely by means of straps several centimeters in length. A certain amount of transverse damping, which could be obtained by the use of felt packing or by employing frictional devices, would still be required, owing to the vibrations that would be produced in a bank.

In this case, we have to reckon not only with variable transverse forces, but also with the bodily movement of the entire engine, when so mounted, on account of the variation in the gyroscopic effect of the two-bladed propeller when the airplane is banking. This latter action is similar to that of a weight mounted eccentrically on the crankshaft and rotating at twice the engine speed, the effects produced by it becoming more marked as the sharpness of the bank increases. Only propellers with more than two blades may be regarded as reasonably free from the effects of such vibrations in banks.

### *Pitching of 6 Cylinder Type*

The pitching or "see-saw" movement of a badly balanced 6-cylinder engine can also be easily calculated. The engine Testing Department tested a 6-cylinder Benz IV engine, which had its three forward pistons made of aluminum, and the three rear pistons of cast iron, each of the former weighing 2.65 kg. (5.84 lb.), and each of the latter 3.62 kg. (7.98 lb.). Tests on a spring-supported test-bench revealed no difference in the amount of vibration, as compared with a normal engine, the 8-cylinder Vee type, also showed no variation from other balanced types. Calculation shows that the pitching movement, at a distance of 500 mm. (19.7 in.) from the center of gravity of the Benz IV engine, with cast iron and aluminum pistons arranged as above, the engine being run freely suspended, was only 0.5 mm. (0.02 in.). This small movement could also be easily taken up by a suitable light spring device. However, with this form of pendulum or spring mounting, the pilot would be cognizant of the fact that there are other factors, beside inertia, that may give rise to forces which operate detrimentally upon the airplane, since the effect of irregular cylinder pressure and the torque variation in the engine can produce much greater and more objectionable results than the effects of inertia alone.

### *Spring Suspensions*

This fact can be observed, at any time, on testing-stands fitted with spring suspension for the engine, as for example, those at Adlershof. There, the engine can be seen to be under strong vibratory action and the vibrations may be felt on the bench, particularly at low revolution speeds, when the effect of misfires and preignition is very marked. In general, each late or premature ignition, each irregularity in the functioning of the two carburetors of a 6-cylinder engine, in the timing of the valves and the ignition in the individual cylinders, and in the distribution of the mixture, is shown by the irregularity in the running of the engine. The torsional oscillations of the crankcase, and that of the crankshaft are inversely proportional to the moments of inertia of these parts about their axis of rotation. If the crankcase is not rigidly attached to the airplane, its moment of inertia is only about ten times that of the crankshaft, including the propeller. If then, the amount of the relative movement of the crankshaft is 3.6 deg. with a fluctuation in speed of $G = \frac{1}{100}$, the angular movement of the crankcase is approximately 0.36 deg., corresponding to a displacement of over 3 mm. (0.12 in.) at a distance of 50 cm. (19.7 in.) from the axis of the crankshaft. As is to be expected, misfires are productive of marked vibrations in the crankcase, when mounted on a spring test-bench, as well as on an airplane, and the effects of irregular engine speed can only be obviated by increasing the number of cylinders, since the employment of flywheels, is undesirable.

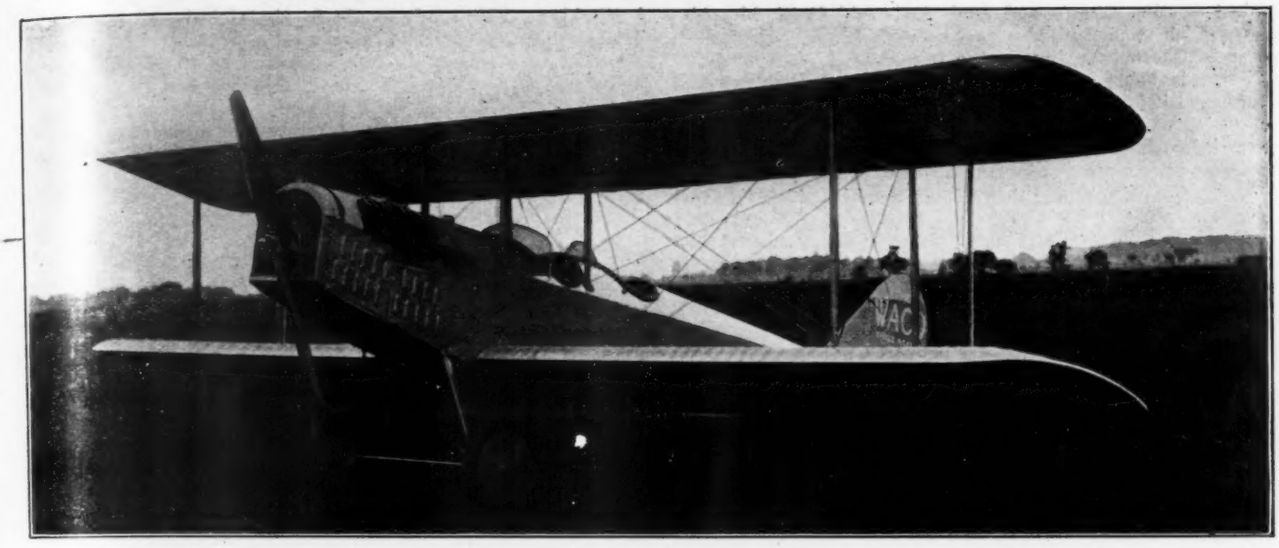
The employment of a spring mounting would undoubtedly reduce the torsional oscillation of the engine to a certain extent, and prevent it from extending to the structure of the airplane. In that event, the normal engine vibrations would reach their maximum magnitude, and the valuable steadying influence of the inertia of the fuselage could not be utilized to minimize their effects. This arrangement would also be detrimental to the piping and other connections between the engine and the airplane.

### *Resonance of Individual Parts*

Lastly, it should be borne in mind that the principal troubles in airplanes occur, primarily, in connection with resonance of the individual parts. These parts may, however, still oscillate together without detrimental effects when the amplitude of the motion is sufficiently diminished by the use of springs. The prime necessity, therefore, is to preclude all possibility of resonance, within the range of the normal number of revolutions of the propeller, by the adoption of appropriate methods of stiffening, strengthening or lightening of the structure. This should be the first consideration in designing new types.

*From Technische Berichte, Vol. III, Part 6, pp. 205-7. (Paper read before the Conference of Airplane Designers at Adlershof, Aug. 23, 1918). N.A.C.A. Technical Note No. 148.

To summarize, it may be said that a flexible connection between the engine and the airplane is probably possible, that this diminishes, primarily, the vibrations due to inertia, and, to a lesser degree, those due to the influence of torque variation. It is, however, far more important to eliminate all possibility of resonance in the airplane. It may, also, be added that the engine vibrates more when freely suspended than when rigidly mounted, this vibration having a detrimental effect on all connections between the engine and the airplane. Therefore, in view of the relatively insignificant advantages which may be derived from the elastic suspension of the engine, the present rigid mounting is to be preferred. This can only be improved by incorporating in the fuselage as many of the rigid airplane parts as possible.



*A recent addition to America's commercial air fleet—the new Waco "Six" three-seater plane (90 hp. Curtiss OX5 engine), which has a remarkable performance for its power*

## Waco "Six" Three-Seater

Among the recent additions to America's commercial air fleet the new 1923 Waco "Six" is eliciting considerable interest and admiration among pilots of the Middle West.

The Waco "Six" was designed by Clayton J. Brukner and Elwood J. Junkin of the Advance Aircraft Co. of Troy, Ohio. It is a three-place OX5 motored biplane, with an astonishing amount of performance considering the power, and has a take-off, climb and speed range which are ordinarily achieved only by higher powered ships.

The lifting surfaces consist of four equal sized interchangeable panels and a center section. The wing curve is of a high lift section and allows the employment of such light and strong beams that one bay is all that is required to adequately brace the panel assembly. Ailerons are fitted to both upper and lower panels and are actuated by a very simple and direct control system.

The fuselage is 34 in. wide at the passenger compartment, and the occupants are afforded ample arm and leg room. It is exceptionally easy for the passengers to get in and out of their cockpit due to the use of a wide sidewalk extending to the trailing edge of the lower wings, and because of the low step over the side of the fuselage. Both cockpits are finished in mahogany. The passengers are protected from the air stream by a large celluloid wind-shield. The motor mounting is such that the vital parts of the motor are very accessible. The fuselage is of wire girder construction.

The landing gear is sturdy and of small resistance, due to the employment of stream line steel tube struts which are joined at the bottom by welding into the axle guides and shock absorber saddles.

The construction details of the empennage follow conventional lines, the chief novelty being the use of a reversed camber stabilizer. Steel construction is used almost exclusively.

The ship's high speed is 88 m.p.h. and it will not lose altitude fully loaded with the motor throttled down to 1050 r.p.m. The climb with full load is in the neighborhood of 465 ft. per minute, a very creditable showing considering the horsepower. The ship's pronounced ability to land in and fly from small fields is proving a pleasant revelation to all pilots who have flown it.

SPECIFICATIONS AND PERFORMANCE

Span (both planes), 30 ft.
Overall length, 24 ft.
Height, 8 ft. 10 in.
Gasoline capacity, 22 gal.
Weight empty, 1125 lb.
Useful load, 750 lb.
Maximum speed, 88 m.p.h.
Landing speed, 32 m.p.h.
Climb with full load, 465 ft. p. min.
Ceiling with pilot alone, 19,000 ft.

## New British Air Regulations

Important amendments and additions to the British air navigation order are contained in an order in council published in the *Official Gazette* of London.

One article provides that—

"A person in an aircraft while flying in or over the British Islands shall not take or cause or permit to be taken any photograph of a prohibited area, or of any park thereof, or of any object therein, except with the special permission in writing of the Secretary of State, and subject to any conditions that may be attached to such permission."

It is provided that any person authorized by the Secretary of State shall have the right of access at all reasonable times for the purpose of inspecting an airdrome; and any person so authorized, and any police constable, shall have access to any place to which access is necessary for the purpose of carrying out his powers and duties under the order.

Powers are given for the detention of any airplane if the proposed flight would be likely to contravene the order or cause danger to persons in the aircraft or persons or property on the ground.

It is further provided that no aircraft pilot, commander, or other officer or member of the crew, shall be in a state of intoxication "or in a state which, by reason of his having taken or used any sedative narcotic or stimulant drug or preparation, his capacity so to act is impaired."

Any person required under the order to have a license is required to produce it on demand for inspection; or in the case of a pilot his log book.

# Aerial Bombardment Maneuvers with Warships

## Air Service to Use Martin Bombers for Sinking Battleships Off Cape Hatteras

The only bombardment group in the United States Army, now stationed at Langley Field, Hampton, Va., is at present conducting target practice with various types of aerial bombs against floating targets and against the old Battleship Alabama which was sunk by aerial bombardment in shallow water in Chesapeake Bay in the fall of 1921. An extensive program is being carried out by the Second Bombardment Group and it is the intention of Maj. Gen. Mason M. Patrick, the Chief of Air Service, to culminate these training maneuvers by sinking two obsolete naval craft by aerial bombardment in order to obtain valuable statistical data concerning the accuracy of various types of aerial bombs dropped from various altitudes. The Army Appropriations Bill approved on March 2, 1923, made available a sum of $50,000 to be used for the continuance of airplane bombing tests against obsolete naval craft, and this amount will be used for the most part in the transportation of personnel and equipment to Langley Field and Cape Hatteras for the bombing maneuvers against these battleships.

It is expected that the bombing of these battleships will take place in the latter part of August or the early part of September. The exact date that they will become available is not yet known but the Navy Department will be prepared to turn over to the Army Air Service about Aug. 20, 1923, the old battleships Virginia and New Jersey, now in Boston Harbor, which must be scrapped under the terms of the Four Power Treaty drawn up by the Limitation of Armaments Conference. The exact date will become known as soon as the Treaty has been ratified and if these two obsolete battleships are made available the maneuvers of the Second Bombardment Group will include the bombing of these vessels.

### *High Altitude Bombing*

The airplanes to be used during these exercises are Martin Bombers equipped with two 400 hp. Liberty motors, similar to those used in the bombing tests in the Summer of 1921. These airplanes are capable of carrying a load of over 2000 lb. of bombs in addition to their regular military load and will bomb from altitudes above 6000 ft. For the purpose of bombing at higher altitudes, from 15,000 to 20,000 ft., one flight of these airplanes will be equipped with superchargers, to enable them to reach higher altitudes with heavy loads.

In order that these battleships may be sunk in compliance with the terms of the Naval Treaty and so that they will not be a menace to navigation they must be sunk in fifty fathoms of water. The fifty fathom curve lies fifty miles east of Cape Charles and about eighty miles east of Langley Field. This is in the general vicinity in which the bombardment tests were conducted against the former German battle cruisers in the Summer of 1921, but this location is so far from shore that considerable over water flying would be necessary which would increase the hazard for the pilots and bombers flying the airplanes. This is considered unnecessary in view of the fact that the fifty fathom curve lies only twenty-two miles off shore east of Cape Hatteras, and it is therefore contemplated sinking the battleships in this vicinity where they will be placed at their final anchorage after being towed from Boston.

As an additional precaution against possible accident and for patroling and observing purposes, it is expected that five or six small seagoing craft such as mine planters or vessels of a similar type will be stationed at intervals between Cape Hatteras and the target. The Army Air Service is also taking action to procure a larger sized vessel if possible for use of observers and other officials who may desire to view the exercises. Parachutes and Kapok vests will be worn by the crew of each airplane as an additional precaution in case of forced landings.

The Chief of Air Service has detailed Brig. Gen. William Mitchell, Assistant Chief of Air Service, to take charge of these exercises and it is intended to establish headquarters for this officer at Cape Hatteras. The present plan is to establish a sub-airdrome on Cape Hatteras from which point the huge bombardment airplanes will operate against the battleships. This airdrome is in the vicinity of the Cape Hatteras Meteorological Station of the Weather Bureau and adjacent to the Durants Coast Guard Station No. 185 (Inactive) on Cape Hatteras. The establishment of an airdrome at this point will give valuable training to the Army Air Service personnel in establishing an advanced airdrome under simulated war conditions for the protection of vital areas of our coasts from air and sea attack.

### *General Plan for Maneuvers*

The general plan for the sinking of the two obsolete seacraft contemplates action against one of the battleships with 1100 lb. bombs by a service flight of airplanes and it is intended to employ 2000 lb. bombs in the sinking of the second battleship. The Army Ordnance has developed a 4000 lb. aerial bomb containing over a ton of explosives but these are still in the experimental stage and therefore will not be used in these tests. The acute shortage of personnel, particularly flying officers in the Air Service and the lack of equipment will not permit the Bombardment Group to operate at full strength. It is expected, however, that two squadrons of approximately six airplanes each will be available for these maneuvers. Several of the pilots and bombers assigned to this duty have been ordered to Langley Field to augment the small force now at that station and the majority of those participating are crack pilots and bombers with war time training and experience and who took part in the bombing of the former German battleship in the summer of 1921.

The actual time during the day at which these battleships will be sunk will be determined later and will depend to a great extent on weather conditions. Prior to the final sinking of these vessels, night maneuvers will be conducted involving the use of pyrotechnics and possibly phosphorous bombs. In connection with the bombing, it is also intended to employ smoke screens laid by airplanes. Two Martin Bombers are at present equipped with tank and nozzle apparatus for spraying purposes. Recent tests with smoke clouds conducted at Aberdeen Proving Ground, Md., sprayed from an airplane indicates a possible tactical use of smoke screens employed by airplanes in connection with the bombardment of battleships. A sufficient amount of chemicals can be carried by one airplane, so the Chemical Warfare Service states to lay a smoke screen about 1000 ft. deep and approximately three miles long. A demonstration will, therefore, be conducted during these exercises to determine the feasibility of bombardment airplanes choosing their own altitudes for delivering an attack against naval craft by maneuvering under cover of such a smoke screen. The successful employment of such a smoke cloud to obscure the aerial view from seacraft and allow the maneuvering of airplanes would give valuable data in connection with the employment of anti-aircraft and indicates the possibility of bombardment airplanes operating at the most effective altitudes under cover of such a smoke cloud.

### *A Necessary Assumption*

The employment of such smoke screens would have to be made on the assumption that the attacking Air Force has control of the air and is, therefore, able to maneuver, hampered only by anti-aircraft fire from naval vessels.

Personnel and equipment to be used in this target practice have been concentrated at Langley Field, Hampton, Va., and will be transferred by air to Cape Hatteras when it is finally determined that the battleships are to be made available. It is not expected that part of the training program of the Bombardment Group which involves the sinking of the two battleships will take more than four or five days.

# Trials of American Schneider Cup Entry

## Curtiss Navy Racer Powered with Curtiss D12 Engine Makes New World's Seaplane Speed Record

One of the two Curtiss Navy racers which the Bureau of Aeronautics, Navy Department, entered in the forthcoming contest for the Schneider Cup at Cowes, England, Sept. 28, was successfully tested on July 30 in Long Island Sound. Piloted by Lieut. Rutledge Irvine, U.S.N., the ship made four speed trials over a measured course of 4.26 miles between Execution Rock and Stepping Stones lighthouses, which it covered at an average speed of 175.3 m.p.h. This performance, made in accordance with F.A.I. rules, betters the existing world's speed record for seaplanes by 29.3 miles.

The Schneider race is the marine air classic of Europe. The trophy which was donated by Jacques Schneider, through the Aero Club of France, is valued at 25,000 francs. The contest this year will consist of a navigability test and a speed contest over a distance of 200 miles. The navigabiilty test requires a considerable amount of taxiing, landing, etc. Rough water conditions of the Solent near Cowes, England, where this race will be held, render this test extremely difficult.

For this reason Lieuts. F. W. Wead, Rutledge Irvine, A. W. Gorton, and D. Rittenhouse, the pilots who have been selected

Wide World Photo

*Curtiss-Navy racer, CR3 type (Curtiss D12 engine) on which Lieut. Rutledge Irvine, U.S.N., on July 30 made a new world's seaplane speed record with 175.3 m.p.h.*

The present official record was made Aug. 12, 1922, at Naples, Italy, by Captain Biard, R.N., when he won last year's Schneider Cup at the rate of 146 m.p.h.

The new Curtiss-Navy racers, designated as type CR3, which will be flown in the Schneider Cup race by Lieutenant Irvine and by Lieut. David Rittenhouse, are marine developments of the Army-Curtiss racers which last year broke all world speed records at Dayton, Ohio, and Detroit, Mich. Lieut. Russell L. Maughan, A.S., holds the world straight-away speed record in the Curtiss-Army racer of 236.5 m.p.h.

The CR3 has twin pontoons and is powered with 400 hp. Curtiss D12 engine. It is equipped with the new all-metal propeller, developed at the Curtiss plant by Dr. S. Albert Reed.

The Navy planes entered in the Schneider race will be painted Navy gray, with the U. S. heraldric colors, blue, white and red, on the tail, and the seal of the Navy Department on the fuselage.

The speed trials were witnessed by Comdr. M. A. Mitscher, Comdr. W. G. Child, F. H. Russell and W. L. Gilmore, vice president and chief engineer, respectively, of the Curtiss company, and by officials of the Aeronautical Chamber of Commerce Rear Admiral W. A. Moffett, Chief of the Bureau of Aeronauties, inspected the plane early in the day, but because of prior engagements at the Naval War College, had to leave before the trials.

to represent the United States in this race have been practicing rough water work for the past two months at the Naval Air Station, Anacostia, D. C. This practice should enable them to compete with good chances of success.

The results of the previous Schneider Cup races are as follows:

1913—Held at Monaco. Won by Prevost on Deperdussin float monoplane (Gnôme engine). Speed, 72 km.p.h. or 44.7 m.p.h. Winning country: France.

1914—Held at Monaco. Won by Howard Pixton on Sopwith float biplane (Gnôme engine). Speed, 89 km.p.h. or 55.3 m.p.h. Winning country: Great Britain.

1915 to 1918—No contests on account of the war.

1919—Held at Bournemouth, England. Won by Janello on Savoia biplane flying boat (Isotta-Fraschini engine). Speed, 201 km.p.h. or 124.9 m.p.h. Victory disallowed on account of infraction of racing rules.

1920—Held at Venice, Italy. Won by Commander Bologna, R.I.N., on Savoia biplane flying boat (Ansaldo engine). Speed, 165 km.p.h. or 102.5 m.p.h. Winning country: Italy.

1921—Held at Venice, Italy. Won by Briganti on Macchi biplane flying boat (Fiat engine). Speed, 189 km.p.h. or 117.4 m.p.h. Winning country: Italy.

1922—Held in Naples, Italy. Won by Captain Biard on Supermarine biplane flying boat (450 hp. Napier "Lion" engine). Speed, 146 m.p.h. Winning country: Great Britain.

# AIRPORTS AND AIRWAYS

*This Department is concerned with all civil flying activities such as the establishment of airports, the marking of airways, warnings to airmen regarding obstructions, experiences gathered on flying routes and landing fields, the work of commercial aviation companies and private fliers, the formation of new air transport enterprises, personal paragraphs of general interest, etc.*

*Communications to this effect, addressed "Airways Editor, Aviation, 225 Fourth Ave., New York City", should be brief, accurate and to the point. They should deal with facts, not with theories or speculations. While American civil flying activities will naturally be given prominence, communications will also be welcomed from Canada, Mexico and other parts of the Western Hemisphere.* EDITOR.

## Boston Wants Air Mail

President Howard Coonley of the Boston Chamber of Commerce has sent a request to Postmaster General Harry S. New for extension of the air mail service to Boston. Mr. Coonley's letter, after pointing out that the Boston airport was established to permit the extension of the air mail service to Boston, describes the accessibility of the local field and states that air mail service is a logical feature of a metropolitan area in which the value of manufactured products is nearly $1,500,000,000.

Following is a copy of the letter:

"Hon. Harry S. New,
Postmaster General,
Washington, D. C.

"Dear Sir:

"Boston business men are practically a unit in the belief that this city and New England should receive the advantage of air mail service.

"The Boston Chamber of Commerce strongly recommends that the present transcontinental air mail route be extended to Boston at the earliest possible date.

"Boston is now ready to receive this service. The new Boston Airport was secured largely because of a desire for and a belief in the advantages to be secured from air mail service.

"It is ideally located from the postal standpoint—few other cities having a field that can be reached as readily from the Post Office. There is ample room for the erection of all necessary facilities, and it is capable of almost indefinite expansion.

"An extension of the existing route would be a very logical one. It would tap one of the leading industrial centers of the country. The value of the products manufactured in Metropolitan Boston alone reaches nearly $1,500,000,000. When the whole district that would benefit by the air mail is considered, this sum reaches far higher figures.

"The Boston Clearing House is second only to the New York Clearing House in the number of checks cleared.

"Already there are at least two excellent landing fields between New York and Boston, at Naugatuck and Hartford. A number of other places on the route have locations that would be satisfactory for emergency fields.

"We sincerely hope that provision for the extension of this service to Boston can be made during the coming year.

"Very truly yours,
"Howard Coonley
"President."

## "Cycleplane" Flies at McCook Field

The first flight in an airplane propelled by foot power was accomplished July 19 at McCook Field.

W. F. Gerhardt, aeronautical engineer at McCook Field, is the inventor of the machine which is a "sextuplane", or six decker.

In the longest flight made before witnesses with the machine, operated by and supplied with the pilot's own power, it rose about 3 in. from the ground and flew approximately 20 ft., which the inventor declares was long enough to insure steady, undecelerated flight.

## The Polar Airways

Vilhjalmur Stefansson, the Canadian Arctic explorer, recently arrived in London to urge the British government to annex Wrangell Island, with a view to its future use as an airport in international traffic. Wrangell Island lies in the Arctic Ocean, northwest of Bering Strait.

Mr. Stefansson presents his point of view as follows:

"I have undertaken the arduous task of teaching my fellow-Britishers that the world is round—a fact generally accepted but rarely visualized—and that within a few decades one of the most valuable regions on the earth's surface will be the northern Polar islands, which will be the basis for air-routes crossing the roof of the world in the shortest distance journeys from America to Europe and Asia.

"When aviation across the northern sea is developed, as it is certain to be, all lands bordering on continents will assume immense strategic importance, and it is only natural to wish for Wrangell, for which I established British claims in 1914 and again in 1921, to become a part of the British Empire."

If the British renounce their claims, Stefansson considers the United States will have the best title to the island because of the landing there of Americans in 1881, but if neither nation asserts ownership the island may go to the Japanese, who, he says, are awake to its future importance.

## Large British Flying Boat

One of the largest flying boats ever built was flight tested early last July at the experimental air station of the Royal Air Force, Isle of Grain. The flying boat is the Fairey N4 type "Titania" which is equipped with four Rolls-Royce "Condor" engines, nominally of 650 hp. each, but actually capable of developing over 700 hp. The total horsepower is thus from 2600 to 2800, and the designed full load 30,500 lb., as against 1600 hp. and 28,500 lb. for our NC type flying boat.

The "Titania is a biplane flying boat of 139 ft. span, 66 ft. overall length and 30 ft. height, and has a total wing area of approximately 3000 sq. ft. The fuel capacity as originally designed was 1000 gal.

The flight tests are said to have been satisfactory. The ship was designed to cooperate with the fleet at high seas, for which purpose high speed, a large fuel capacity and a high degree of seaworthiness are required.

## Aviation in Honduras

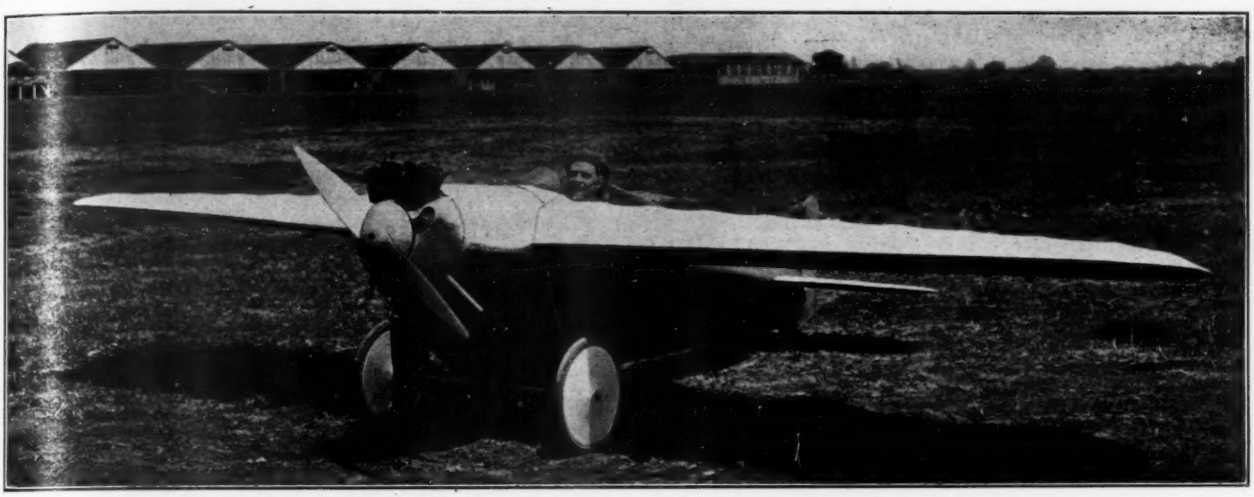
Tegucigalpa, the capital of the Republic of Honduras, recently witnessed the arrival of a two-seater, 7-cylinder, 180 hp. airplane which is to be used for commercial purposes. The owner of the plane, who also acts as pilot, has entered into an agreement with a local automobile transportation concern in which he will operate this machine and any planes subsequently purchased.

During the short time the aviator remained in Tegucigalpa, he made numerous flights over the city and two trips to the north coast. He has won the confidence of the natives and bears the reputation of being the best aviator that has arrived in the country. (Consul Franklin E. Morales, Tegucigalpa, Hond., June 27.)

## New Mummert Sportplane

The new Mummert Sportplane, which is one of the first really successful small planes driven by a stock-model motorcycle engine, was designed and constructed by Harvey C. Mummert, aeronautical engineer for the Curtiss Aeroplane & Motor Co., Inc. of Garden City, N. Y.

The present ship is a single-seater cantilever monoplane designed to meet the present demand for a low powered inexpensive airplane having a comparatively large cruising radius and capable of being operated at a very low cost. And these requirements are apparently met by the Mummert machine, which weighs only 300 lb. empty, has gas capacity for about 12 hr. sustained flight at 75 m.p.h. and can cover approximately 50 miles per gallon of gasoline.



*The new Mummert "Sportplane", fitted with a stock Harley-Davidson motorcycle engine, which was built by Harvey C. Mummert in the Garden City plant of the Curtiss Aeroplane & Motor Co.*

The fuselage is constructed of 3-ply maple veneer, nailed and glued to laminated spruce diaphrams which encircle three longerons. It has a very roomy and comfortable pilot's cockpit, and the vision ahead is extremely good.

One interesting feature is the location of a window on each side of the fuselage, provided by simply covering a portion of the wings with celluloid, in the vicinity of the body.

The wing beams are continuous across the fuselage and are fastened to the top longeron fittings with small pins, which may be easily removed, and the wings quickly detached. The beams are of box girder type, and the ribs consist simply of two cap strips glued to a solid web of 1/28 in. veneer. Doped fabric is used for the wing covering. The ailerons are veneer covered.

A new type of landing chassis has been evolved. It is entirely of tubular construction, and the shock absorbers are located inside of the fuselage.

The vertical and horizontal tail surfaces are faired into the body. On account of the large amount of fin surface aft provided by the fuselage, due to its particular shape, the designer has succeeded in obtaining ample statical stability and control in the air and on the ground, with a comparatively small amount of vertical tail area.

A special type of variable gearing between the stick and control surfaces prevents the machine from being too sensitive on the controls at high speeds, and insures ample movement of the control surfaces for small stick displacements at low speeds.

The engine is a stock model Harley- Davidson, mounted on a light pressed steel frame which is bolted to the fireproof bulkhead on the front end of the fuselage. The gas and oil tanks are located between the pilot's cockpit and the engine, and are readily accessible for refilling.

Another interesting feature is the Reed type of duralumin propeller which was constructed specially for this machine by Mr. Mummert. Its diameter is 52 in. and its maximum r.p.m. 2800.

The overall span of the machine is 20 ft., and length 14 ft., 1 in.

## British Light Plane Progress

Some interesting flight tests were recently made by Sqn. Leader E. A. Wright, R.A.F., with the "Wren" light plane, which is fitted with a 7 hp. motorcycle engine. The machine was flown on one occasion for 68 min. at full throttle, using less than a gallon of fuel. The high speed was found to be 52 m.p.h. and the low speed about one half that figure.

The "Wren" is 37 ft. in span, 23 ft. in overall length, and weighs 210 lb. net. Only 3½ hp. are said to be required for horizontal flight.

Another interesting British light plane is the machine built by Maj. O. T. Gnosspelius, one of the earliest British seaplane pioneers. This little cantilever monoplane measures 36 ft. 3 in. in span, 19 ft. 6 in. in overall length and has a wing area of 142 sq. ft. Its most notable feature is the use of 4 ft. twin pushers driven through a 2:3 chain reduction gear from a standard 697 cu. cm. Blackburne motorcycle engine. The propellers are designed to turn at 2200 r.p.m. in the air. The engine develops 20 hp. at 3250 r.p.m.

The wing shape is rather unusual, the wings being of heavily raked plan form, the chord diminishing from 5 ft. 6 in. in the center to 1 ft. 4 in. at the center line. A remarkable feature of the wing is the fact that it is fitted with a step of about ¾ in. depth on the upper surface just behind the front spar. It is claimed that this step improves the efficiency of the wing.

The fuselage is built like a boat, of elm hoops planked with spruce of about ⅛ in. thickness. This structure is internally reinforced over its front half by a wire-braced framework of spruce longerons and struts, to take the pilot's seat, controls, landing gear and wing attachments. The landing gear is reduced to its simplest expression, and consists of a pair of rubber sprung wheels, the axle of which is carried inside the fuselage so that only one third of the wheels protrudes therefrom.

In recent flight trials held at Lympne, England, the Gnosspelius light plane developed a high speed of 65 m.p.h. and reached a height of 2500 ft.

## Damascus-Bagdad Airway

A new airway was opened in the Near East last April, when Lt. Colonel Denain, commandant of the French air force in Syria, made a return flight from Damascus to Bagdad via Palmyra, Deir-ez-Zer and Hit. This airway is 560 miles long and is well provided with emergency landing fields and markers. This route will be used for accelerating mails between Paris and Teheran, Persia. The service will operate on a monthly schedule, airplanes being used between Beyrouth and Bagdad, and from there automobiles to Teheran.

An air mail service is already operated by the Royal Air Force between Bagdad and Cairo, Egypt, on a half-monthly schedule.

# U. S. ARMY AND NAVY AIR FORCES

## U. S. ARMY AIR SERVICE

### New DH4B Planes for Airways

The Repair Depot at the Fairfield Air Intermediate Depot, Fairfield, Ohio, has completed the design and started construction on the new DH4B4 planes for use on the Model Airways.

Shortly after flight on the model airways was reduced to regular schedule the inadaptability of the standard DH4B became apparent, and plans were instituted for redesigning this job to more nearly fit the needs of this airways work. Suggestions were invited from all interested pilots and, as a result of these various suggestions, this new plane will soon be available for this work.

No real basic change has been made in the lines or surfaces of the old DH, but rather a rearrangement of the interior to provide a plane more adaptable to the needs of the service. The old 88 gal. gasoline tank has been replaced by one of 110 gal. capacity, thereby adding 60 to 90 min. flying radius. A new and larger oil tank with a capacity of 13 gal. has been installed. The front cockpit has been equipped with all the latest devices for the aid and comfort of the pilot. The rear cockpit has been replaced with a cargo compartment equipped with a streamline cover. This compartment is equipped with a collapsible seat so that a passenger may be carried in this compartment if necessary. All compression members about this compartment have been materially strengthened or replaced by bulkheads, thus thoroughly bracing this compartment against distortion by the load to be carried. Standard DH parts have been used wherever practicable, but at least 160 new parts have been designed and incorporated in this new plane.

The initial order is for twenty-one planes of this type, and the first has just been completed and at the present time is undergoing its flight test.

### An Incentive to Efficiency

There is no denying the fact that the Army Air Service has an excellent corps of trained aviation mechanics, due principally to the successful operation of the Air Service Technical School at Chanute Field, Rantoul, Ill. The many exceptional flights by Air Service pilots bears out this statement.

Believing that there is nothing like competition to spur one on to his best efforts, Lieut. Edwin J. House, commanding the 6th Pursuit Squadron, stationed at Luke Field, H. T., adopted a novel scheme of promoting efficiency among the mechanics of his squadron. At the weekly inspection of airplanes, the ship awarded "excellent" rates a silver star, to be placed after the crew chief's name on the fuselage. The first chief who received five silver stars will be awarded a silver efficiency trophy by Lieutenant House. The planes are inspected carefully from every angle, and to win a star the crew chief and his crew must work hard and pay strict attention to business at all times.

At last reports Sergt. Wm. B. Fox, crew chief of DH4B plane No. 12 was setting the pace with two silver stars to his credit. Much interest is being shown by the various crews, and every chief has hopes of overcoming the lead held by Sergeant Fox.

An Air Service officer who lately arrived from Luke Field and is now stationed in the Office of the Chief of Air Service, Washington, states that the efficiency competition inaugurated by Lieutenant House has produced most excellent results.

### Change of Station

The Adjutant General's Office announces that the 16th Observation Sqn. and the 9th Photo Section have been transferred from Fort Riley, Kan., to Richards Field, Mo.

### Army Orders

First Lieut. Howard C. Brandt, A.S., from Chanute Field at Camp Vail, Little Silver, N. J., for course of instruction in advanced radio.

Capt. Ralph Royce, A.S., promoted to major.

One month and fourteen days leave of absence to Capt. Harry H. Young, A.S.

Tech. Sergt. William C. Thompson, 40th School Sqn., A.S., to be retired Kelly Field.

One month and three days leave of absence to Lieut. Carlyle W. Graybeal, A.S.

Order to First Lieut. Elmer E. Adler, A.S., from Fairfield A.I.D. to 88th Sqn., revoked.

Wrt. Off. Charles B. Goodman, A.S., from St. Louis, Mo., to Kelly Field.

Col. William H. H. Hutton, A.S.O.R.C., Detroit, called to active duty with consent as supervisor of Detroit district office, Industrial War Plans Division.

First Lieut. David G. Linglem, A.S., from Selfridge Field to O.C.A.S. for duty.

Resignation of First Lieut. Kenneth Gatiss Fraser, A.S., accepted.

First Lieut. Paul C. Wilkins, A.S., redirected from Bolling Field to sail for Hawaii from San Francisco, Sept 25, 1923.

First Lieut. James B. Jordan, A.S., from Scott Field to Kelly Field for temp. duty in observers' course, then to sail for Hawaii via San Francisco, Sept. 25, 1923.

Sec. Lieuts. Patten Wright Burns, Floyd Rowland Clafford, Byron Asberry Glover, Delma Hudson and James Turner Nolen, A.S.O.R.C., with consent to active duty for four months course of instruction in primary flying, Brooks Field, effective Sept. 1, 1923.

Following Sec. Lieutenants, A.S.O.R.C., ordered with consent to active duty for four months course of instruction in primary flying, Brooks Field: Will Carleton Hale, Westover, Tex.; Lieuts. Nathan Atkinson Brown, jr., Columbus, Ga.: William Ralph Enyart, Connersville, Ind.; James Montreville Sutton, Atlanta; Otto Paul Weyland, Chicago; Raymond Milton Wilson, Newton, Ill.; Ellis Way Bullock, Tampa, Fla.; John Ryle MacGregor, Oakland, Calif.; James Davis Fall, U. of Wash., Seattle; Carl John Sack, Cambridge, Mass. To revert to inactive status Dec. 31, 1923.

Sec. Lieuts. Richard A. Peterson, A.S., and Fred J. Woods, A.S., advanced flying training, Kelly Field, to C. O. Kelly Field for duty.

Sergt. Manlon Todd from Saunders Range, Md., to Washington, D. C., for temp duty with training of National Guard.

Capt. Thomas F. Weldon, Med. C. from Mitchel Field to Fairfield A.I.D.

### Air Service Supply Situation

Capt. E. E. Adler, Officer in Charge of Property, Maintenance and Cost Compilation, Fairfield Air Intermediate Depot, Ohio, recently returned from a two months' inspection trip, during which he visited Crissy Field, Mather Field, Rockwell Air Intermediate Depot, Kelly Field, Brooks Field and the San Antonio Air Intermediate Depot. He made a detailed study of the Supply Departments and Engineering Departments at each of the fields he visited and expressed himself as being greatly pleased with the progress that has been made. The Repair Shops at San Antonio and Coronado, Captain Adler states, have reached a high degree of efficiency. Both of these shops have capable Engineer Officers in charge, and the civilian personnel is made up of loyal, hard-working men who "know their stuff" and who are delivering the goods. The responsibility of maintaining our flying equipment rests, in no small degree, with the faithful mechanics (both civilians and enlisted men) in our Repair Depots and Service Squadrons, and every pilot realizes it.

## Night Flight of Airship TC2

A recent night flight made by the army airship TC2 from Akron, Ohio, to the Aberdeen Proving Grounds, Md., its permanent station, marked another step in the progress of lighter-than-air aviation. The flight began at 11.30 p. m., Thursday, May 31, and lasted for seven hours, the landing at Aberdeen being made at six o'clock the following morning.

The performance of the ship from start to finish was excellent, and the mission of the flight was carried out without any serious delay or hindrances. The TC2, a sister ship to the ill-fated TC1, lately destroyed at Wilbur Wright Field, was manufactured by the Goodyear Tire and Rubber Co. of Akron, and is one of four similar ships being constructed by that company.

Although the altitude of the flight was 4500 ft., there was no inconvenience experienced by any member of the crew in the open car. The shifts in piloting were limited to two hours each, so as to give all of the crew an opportunity to handle the new ship.

For those who have never flown at night, without definite points on which to establish their course, it may be of interest to explain how a ship can start out seemingly blindly and arrive at its destination. Reliance must be placed in the compass and other instruments with which the ship is equipped, and due allowance is made for wind direction and the speed of the craft, both of which will cause the ship to drift from its course. A few minutes prior to taking off, the last word in direction and velocity of the wind were given to the officer commanding the ship. Computations were rapidly made to determine the drift and actual speed over the ground the ship would make, and the reading of the compass to be followed during the night was then determined.

Inasmuch as cities, rivers and mountains were on or near the path of the flight, the computed location of the ship and the height of the ground, above sea level, at the end of each hour were carefully noted. For example, it was determined that at the end of the first hour the ship was to be flying over ground 1200 ft. above sea level; at the end of the second hour, 1400 ft. above sea level; third hour, over three mountain tops 3500 ft. above sea level. The pilots were then instructed that the altitude of the ship would be so regulated that the ship would fly at not less than 1000 ft. altitude all during the night.

The ship was taken off 300 lb. "heavy", which means that the handling crew shoved the car upward as far as possible and the ship was given the maximum headway before being able to settle to the ground. It circled upward in the darkness, with all its lights showing, and from the ground the ship looked very much like an ocean steamer as it appears in the night.

From the viewpoint of those on board the ship as it plunged upward into absolute blackness, the only visible points were the lights in the hangar below, which showed up in the night. The ship made a wide circle around the hangar, as the orders directed that the ship was not to proceed on its course until everything had been tested and found to be in good order, and the ground crew remained in position until the ship headed away. Everything was found to be working satisfactorily and the ship pointed her nose in such a direction that the compass showed 120 deg., when the flight to Langley Field, Va., began.

As soon as the ship was under way everything on board was made as dark as possible, with the exception of the necessary navigation instruments. Here and there scattered groups of lights were picked up on one side or the other, and a good check of the flight was being constantly made. The pilots held steadily on the course determined upon, and one by one the cities and towns that were to come in the path appeared, and the big ship was gradually nosed up to the predetermined altitude. Presently a big moon, which had been obscured by the mist, rose high enough to throw a faint light on the ground below, and by its glint a river was observed a number of miles ahead. A prompt examination of the charts was made and the river was identified. Other rivers, cities and visible marks, such as groups of coke ovens, were constantly noted and being used to check the course of the dirigible.

The view over Pittsburgh, Pa., at two o'clock in the morning, with its countless rows of lights and the glare from the steel foundries, was a sight not easily forgotten, nor will the crew quickly forget the view of the broad Ohio River showing in the moonlight like a silver ribbon with a black background.

The shifts of piloting were so arranged that a crew of two pilots and one engineer were on duty two hours before the relief crew took their place, but the keen pleasure of the trip and the desire to miss no view of what they were passing over kept all from sleeping. It was well worth while, for the moon began shortly to shine on rolling mountains whose tops looked right under the ship, while in reality they were 100 ft. below. A heavy mist began to settle in the valleys, and it was not long before the mountain tops stood out as black wooded islands, in a sea of white clouds.

After a short while, clouds began to form around the airship itself, cutting off all view below and the moon from above, and for a period the navigation of the ship depended entirely upon the instruments set before the pilots. Dawn came while the ship was still flying in the clouds, and gradually as the world below the ship began to light up it became possible to check the course on the terrestrial objects.

About this time one of the engineers reported a slight leak in one of the oil tanks. The ship was promptly turned off its path to the nearest town in the Cumberland Valley, in order to enable an accurate check to be made on location. The railroad station was situated in a place very difficult to approach, and two circles were made over the quaint little town before it was identified as West Minster, Md. Because of the trouble which developed in the oil line and the unfavorable winds, the course was immediately changed so that the ship would make Aberdeen Proving Grounds instead of Langley Field.

After two more hours of flying over the billowy clouds, during which time an occasional view was had of the fertile country in Northern Maryland, the broad Chesapeake Bay finally came into view. A fortunate shift of the wind cleared the air of clouds a few miles to the south, and the airship hangar at Aberdeen could be seen.

From that time on until the sound of the motors woke up the post, the crew gave directions for landing to a few men on the ground, and the ship was greeted with cheers at its new home as it made its first stop after leaving the Great Lakes. After a perfect landing, the ship was promptly put away in the hangar.

## Liberty-12 Special Production Tools

An important piece of work has just been accomplished by personnel attached to the Maintenance Section of the Property Maintenance and Cost Compilation, Fairfield Air Intermediate Depot, Fairfield, Ohio. The work undertaken included the segregation, classification and storage of a set of Liberty engine production tools as a war reserve.

Upon the signing of the Armistice in November, 1918, the contractors building or preparing to build Liberty engines turned over the tools which they were using to the Government in accordance with their contracts. Many of the tools had been in use for some time and were practically worn out; others were in excellent condition. A decision was made to retain one set of Liberty tools, and these were shipped to Middletown, Pa., Montgomery, Ala., and Fairfield, Ohio. Due to the pressure of other work which existed in the Office of the Chief of Air Service at that time, no attempt was made to segregate and classify these tools until February, 1922, at which time the project was started and has extended over a period of sixteen months.

The actual segregation required personnel of the highest class. These men traveled to the fields where the tools were located, selected such tools as would be necessary for this work, and superintended their packing and loading for shipment to Fairfield, where they are now stored.

It is estimated that 10,500 individual pieces were handled in this segregation, weighing approximately 137 tons, 57 tons of which were shipped to Fairfield from Montgomery and Middletown. The final selection comprises over 6000 pieces, weighing 127 tons.

These tools are now in a permanent fireproof storage space at the Fair field Air Intermediate Depot, and will be retained indefinitely, to be used in the production of Liberty engines should an emergency ever arise.

### New Squadron Insignia

George McManus, the famous cartoonist and originator of the well known cartoon "Bringing Up Father", probably never had the faintest notion that his pet subject would be adopted as the insignia for an aero squadron. Kelly Field states that the 41st Squadron at that station has adopted as its insignia a replica of "Maggie" with the inevitable rolling pin in her right hand, pointing onward to the attack with the left. This insignia was selected as being emblematic of the name and functions of a squadron as a school of attack aviation.

### Radio Towers at Wilbur Wright Field

Two new radio towers, 165 ft. high, have been erected at Wilbur Wright Field, Fairfield, Ohio. The towers were painted black and white, the antenna have been put in position, and all necessary equipment installed in the new radio building. This new station supersedes the old radio station, and Fairfield is now in a position to handle all official messages "with neatness and dispatch."

### Dawn to Dusk Flight Off

The Air Service does not propose that Lieutenant Maughan make another trial this year of the "Daylight Flight" across the continent. Days are getting shorter, so that the Chief of Air Service has decided that there will be no further attempt to make the flight this year.

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## U. S. NAVAL AVIATION

### Naval Aviation Reserve Expansion

Plans for expanding the Naval Aviation reserve organization throughout the country have been formulated in the Navy Department and will be presented to Congress at the coming session this winter with the request that financial provision be made for putting them into operation. They will provide for the maintenance of a reserve of 600 officer pilots and will enable the establishment of reserve units in each of the thirteen naval districts. This will increase aviation reserve activities tenfold.

Acting on instructions from Assistant Secretary of the Navy Roosevelt, the Bureau of Aeronautics of the Navy Department has drawn up in detail a plan for a reserve aviation organization such as is outlined above. It will be placed before Congress at the next session together with the reasons that necessitate an increase in the present insignificant reserve force which Naval Aviation could draw on in the event of required expansion. At the present time the aviation reserve units in the Navy number in personnel approximately 200. This number represents almost exclusively Naval Aviation pilots who were trained during the war and were retained in reserve status through the meager funds available since the close of the war.

Under the plan which has been developed it is proposed to enroll 600 aviation pilots in the reserve force and in addition pilots at the rate of 130 per year. Recent inquiries instituted by the Department in the thirteen naval districts under its jurisdiction indicate a ready response on the part of ex-service pilots and others who are eager to enroll for training if Congress makes the provision that will be asked.

The matter of a trained reserve for the aviation branch of the Navy has been given deep study by naval authorities and the situation as it stands at present is recognized as unsatisfactory. It is pointed out that there are today in the aviation forces of the Navy both active and reserve about one tenth of the personnel that was necessary for Naval Aviation during the last war. The expansion that took place at that time, although accomplished under pressure, required time that might be a vital factor in any future national emergency. Recognition must be made of the fact that under other circumstances time for expansion might not be available. The need for a reserve aviation organization proportioned to the active establishment has been increasingly apparent with the trend of aviation development in the fleet. In the past three years Naval Aviation has broken away from the shore base and become an integral and vital part of the fleet organization. An adequate aerial force to supplement the surface fleet bespeaks the need of increased personnel in an emergency, and the fact that such personnel must have specialized training and peculiar fitness for the duty renders imperative the maintenance of an adequate reserve available at all time.

When the United States entered the world war there were 200 officers and men on duty in connection with aviation in the Navy. At the close of the war this number had been expanded to 40,000 or 170 times its original size. At the present time there are in round numbers a little over 4000 officers and men on duty in connection with aviation in the Navy, while the reserve force available is less than the total of active personnel at the beginning of the war. Such a condition is recognized as unhealthy and unwise, and Congress will be asked to remedy it.

The policy as outlined by the Bureau of Aeronautics contemplates an organization of thirteen units with an operating allowance of two planes and 50 spares for each unit. Six hundred Class 5 Naval Reserve aviators would be enrolled who are either ex-service pilots or commercial pilots. In addition it is planned to have in each of the thirteen units ten men with the rating of seaman second class who would be under training in ground school and flying and another ten men taking advanced training with an active service unit.

Under the present appropriation it has only been possible to maintain aviation units in New York and Boston, with a possible third unit to be established later in the fiscal year. This represents the limit under the appropriation for the present fiscal year.

### Flights from the U.S.S. Langley

Some interesting flights were made from the U. S. Navy aircraft carrier Langley in the Hudson river off 96th Street, New York city, during the week ending July 28. The flights of July 27 were witnessed by Acting Secretary of the Navy Roosevelt.

Flights were made daily from the Langley, which visualized the operation of aircraft in battle. From the flying deck, 484 ft. long and 65 ft. wide, a squadron of Vought-Wright planes were sent off in simulation of scouts that search the seas for a radius of 500 miles; fighting craft that combat similar enemy fighters for the control of the air; observation planes which correct and direct by radio the gun-fire of surface craft; bombers carrying explosives and torpedo planes to launch their weapons under cover of smoke screens laid from the air.

Operations were under the direction of Capt. S. H. R. Doyle, commander of the Langley, and Comdr. Kenneth Whiting, executive officer, who is the second oldest pilot in point of service in naval aviation. The Langley is a converted collier of 14,700 tons, with a capacity of some 25 or 30 planes of fighting type set up and storage space for 100 knocked down.

"The type of ship which is considered most essential to any fleet in order to insure the control of the air," Captain Doyle said, "is the aircraft carrier. The United States should build at once at least two 10,000 ton carriers, with as high speed as possible in order that they may be developed when there is sufficient time for experiment and practice. It is not believed that Government funds could be more judiciously expended than to devote them to this purpose, as the most effective means of warfare is always, in the end, the most economical."

In the meantime, in the Camden and Fore River shipbuilding yards the battlecruisers Saratoga and Lexington are being converted into carriers. These sister ships of 33,000 tons and 180,000 hp. will have a speed of 35 knots, which will make them the fastest fighting ships in the world. Their flying decks will measure 825 ft. by 100 ft. and they will carry fully set up and ready for battle between 100 and 150 planes, depending on their size. The Saratoga probably will be in commission by 1925.

### Admiral Moffett to be Promoted

The name of Capt. William Adger Moffett, acting Rear Admiral by virtue of his being chief of the Bureau of Naval Aeronautics, is third on a list of five naval captains, recommended for promotion to permanent rear admirals in the Navy as soon as vacancies occur. The list has been approved by President Harding and was made public July 28 by the Secretary of the Navy.

## Naval Air Maneuvers

With the arrival in Newport, R. I., from New York on July 18 of twenty-two scouting, bombing and torpedo planes, under Captain W. R. Gheradi, commander of the Air Force in the Atlantic, there was begun the concentration of sub-surface, surface and over-surface forces for maneuvers off the coast between Boston and New York which involve, for the first time in the history of the United States, the extensive use of aircraft as the pivot of future naval warfare.

The twenty-two planes constituting Scouting Squadron One and Torpedo-Bombing Squadron One, took off in sections of three from the Hudson River, New York, beginning at nine o'clock and by mid-afternoon all had been moored at the aviation base near the Naval War College. It was a remarkable demonstration of the transfer, independent of other means, of a complete areial fighting organization. The flight was made in divisions of six planes, the commander, Captain Gherardi, flying from one his pennant. Captain Gherardi had the controls of his flagship for the greater part of the 160 mile flight. Accompanying Captain Gherardi in his flagship was Luther K. Bell, Secretary of the Aeronautical Chamber of Commerce of America.

The course of flight took the two squadrons to rendezvous over Gravesend Bay, thence off the south shore of Long Island. The Island was crossed over Great Peconic Bay and Shelter Island, then past Fisher's Island and up Narragansett Bay.

The maneuvers in which the aircraft are to participate are to be under the command of Vice Admiral Newton A. Mecully, commander of the Scouting Fleet, which, under the recent amalgamation of both Atlantic and Pacific naval forces, corresponds to the Atlantic Fleet. They will extend during July and August and part of September and will be viewed the latter part of this month by Assistant Secretary of the Navy Roosevelt, who will be flown to Newport from New York. They will call into action four battleships and some twenty destroyers and twenty submarines, mine layers, tenders and auxiliary craft. The aircraft will be based on the U.S.S. Wright, Captain Gherardi's flagship, and will be served by the tenders Teal and Sandpiper.

Admiral McCully and his staff have worked out a series of tactical problems, the first of which will be an attack by "hostile" forces on Narragansett Bay. The entire fleet will be split into three parts, one "defensive" unit being located in the region of Boston and the other near New York. The "enemy" will be superior to either "defensive" fleet, but inferior to the two combined. The Air Force will be based at Newport and upon the fliers will rest the responsibility, in simulation of actual war, of first, locating the "enemy", then notifying each "defense" fleet and aiding in their junction, and, finally in joining in the battle.

The maneuvers are developed from war games played last year off Panama, when only an incomplete squadron of the F5L type of flying boat was available for the aerial "defense" of the canal. On that occasion six hundred miles of coast line were open to attack and in four days the aircraft covered 910,000 square miles of sea. In the present demonstration, three hundred miles of coast line are involved, but the problem is complicated by the defense of two cities particularly vulnerable to devastation from the air.

The arrival of Captain Gherardi's squadrons reveal something of the relative position in the air occupied by the United States Navy. Future warfare, as it will be demonstrated in the next eight or ten weeks, involves first of all, it is declared, absolute control of the air. This necessitates in the current naval program, the equipment of every battleship, battle cruiser and light cruiser with catapults for the launching of observation planes to locate the enemy and of fighting planes to protect the observers; the construction of aircraft carriers capable of "mothering" from seventy-five to one hundred planes each; and the development of long distance bombers capable of sustained flights of one thousand miles or more.

Against this program, the Atlantic Air Force embraces twelve F5L flying boats of a type originated in 1918 and twelve Douglas torpedo planes, designed this year, and delivered from the aircraft plants within the last few weeks. Complete squadrons should number eighteen. Three cruisers of the Richmond type are equipped with the Vought-Wright observation planes. Others have yet to be armed. Several battleships of the Wyoming and Arkansas type have observation and fighting aircraft aboard; the rest have not yet been protected. An experimental carrier, the Langley, is in service and has sailed from Norfolk, Va., for the maneuvers. Two battle cruisers affected by the Five-Power Naval Treaty, the Lexington and the Saratoga, are in process of conversion into airplane carriers. They will accommodate 72 planes each. To the shore stations are attached one squadron or more of Martin bombers, the type which dropped 2,000 lb. TNT bombs and sank the Ostfriesland and other ex-German war vessels off the Virginia capes in 1921.

## Admiral Moffett to Boston on the Langley

Rear Admiral W. A. Moffett, Chief of the Bureau of Aeronautics, Navy Department, went to New York City on Saturday, July 28. He inspected the Naval Air Station (inactive) at Rockaway, L. I., and the U. S. Naval Reserve Air Station at Fort Hamilton, Brooklyn. Admiral Moffett took passage on the aircraft carrier Langley at New York on July 30 for Boston. While there he inspected the Naval Air Station (inactive) at Chatham, Mass., and the U. S. Naval Reserve Air Station at Squantum, Mass., near Boston.

## Assistant Secretary to Newport by Plane

On July 26 a plane from the Aircraft Squadrons took Assistant Secretary Roosevelt to Newport, R. I., from New York City for a short visit. While there Colonel Roosevelt gave a talk to the personnel of the Aircraft Squadrons Scouting Fleet now stationed at Newport for the summer. The Assistant Secretary also addressed the class of the Naval War College at Newport.

He left New York in an F5L flying boat at 8.30 a. m., arriving at Newport at 11.30. He returned to New York by plane at 6.15 p. m.

## Special Aerological Observations

Instructions are being issued to all the Navy aerological observatories situated near the coast to take special observations of phenomena connected with the seabreeze during August and September. Certain questions with regard to these phenomena were recently raised by the director of a prominent meteorological observatory in this country. This is an excellent example of the service rendered by the Navy to the advancement of the science of weather observation in the country as a whole.

## Medical Assistance by Marine Planes

A plane from Marine Observation Squadron Two at Port au Prince, Haiti, was sent into the wild hill country of that island during the week of July 7 to reach Major Clapp, U.S.M.C., taken ill at Hinche. One hour and a half after the call was received the plane and patient were back at Port au Prince. A trained nurse was brought by plane from Cape Haitien.

## COMING AERONAUTICAL EVENTS

### DOMESTIC

Oct. 1-3 — National Airplane Races, St. Louis, Mo.
Late Fall — Curtiss Marine Flying Trophy Race

### FOREIGN

July 20-Aug. 12 — International Aero Exhibition, Gothenburg, Sweden
Aug. 3-31 — Sailplane Meet, Rhoen, Germany
Aug. 5-26 — Sailplane Meet, Vauville, near Cherbourg, France
Sept. 23 — Gordon Bennett Balloon Race, Brussels, Belgium
Sept. 28 — Schneider Maritime Aviation Trophy Race, Cowes, Isle of Wight, England
Dec. 1 — Entries close for French Engine competition

### Photographic Laboratory on ZR1

A photographic laboratory is being installed on the ZR1, the big Navy airship now nearly completed at the Naval Air Station at Lakehurst, N. J. This laboratory will be equipped for developing and printing still photographs and motion picture film and will be located in the keel of the ship, where supplies and quarters for the crew are situated.

By its use photographs and motion picture film taken in flight can be finished while the ship is still in the air, ready for distribution upon landing. In the case of an extended flight of some days the completed photographs can be dropped over the side by means of parachutes while passing over cities or pre-arranged points. This is a revolution in speeding up the publication of pictorial records of aerial flights, enabling the public to look at the remarkable views as seen from an airship a few hours after they have been witnessed by the passengers on the airship.

In time of war this will be of the greatest military value, greatly increasing the value of airship scouting at sea with the Fleet. An airship on important scouting work, passing over enemy formations at sea or fortifications will take pictures, both still and moving, and develop them ready for inspection as soon as a friendly vessel or station is reached or even passed over. The developed pictures will also be of great value to the airship commander, enabling him to study in flight, the area passed over, facilitating accurate and complete radio messages to his base, either afloat or ashore.

### Submarine Plane Tested at Anacostia

The Navy submarine plane was tested at the Naval Air Station at Anacostia, D. C., on Friday, July 27. This tiny plane is for use on submarines at sea.

They are being produced in quantity for the Navy by the Cox-Klemin Co., of Garden City, L. I., N. Y. A number of these planes are being delivered to the Naval Air Station at Hampton Roads, Va., where they are to be stored pending actual use on board submarines. It is expected to install one of these planes on a submarine next month. The plane being tested at Anacostia is a wood and wire plane.

The Glenn L. Martin Co. of Cleveland is developing an all metal plane of the same size for similar use. This plane also will soon be in service with submarines.

### Orders to Officers

Lieut. William Nelson, (Construction Corps), detached Bethlehem Shipbuilding Corporation, San Francisco, to Naval Air Station, Lakehurst, N. J.

Lieut. Oscar W. Erickson, detached Air Squadrons Battle Fleet to Naval Air Station, Pearl Harbor, T. H.

Lieut. William S. Hactor, detached Receiving Ship San Francisco to Air Squadrons Battle Fleet.

Bosn. John O. Strickland, detached Naval Air Station Hampton Roads, Va., to U.S.S. Pelican.

Lieut. Doile Greenwell, detached Command U.S.S. Eagle 40 to command U.S.S. Pelican.

Lieut. Charles T. B. Gladden, detached Receiving Ship San Francisco to Naval Air Station, Pensacola, Fla.

### F Boat Donated for Rescue Work

Ensign Van de Water of the Naval Reserve Air Station at Fort Hamilton, New York City, has given his F boat to the station for use as a rescue boat. Ensign Van de Water is to be congratulated on his splendid spirit of co-operation and unselfishness.

### Anacostia Photographic Laboratory

The temporary photographic laboratory at the Naval Air Station, Anacostia, D. C., is being dismantled in order to provide for its use as a barracks for enlisted men. The new photographic laboratory under construction will not be ready for use before the latter part of September.

### Swimming Team Makes Record

Edward Herzog, Captain of the Naval Air Station, San Diego, swimming team has broken the record for the Biological La Jolla Open Water Swim. This is over a mile and a half course at La Jolla on the California coast. Herzog's time was 41 min. 45 sec.


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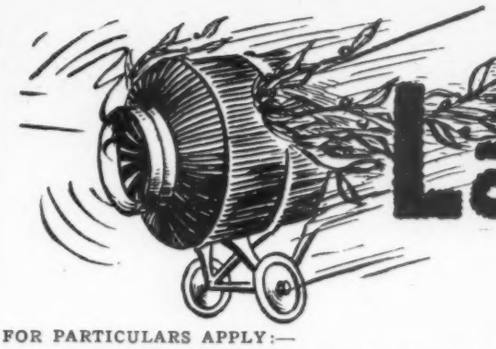

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